SOITEC Silicon On Insulator Technologies SA et al v. MEMC Electronic Materials Inc. Doc. 325

IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF DELAWARE

S.O.I.TEC SILICON ON INSULATOR TECHNOLOGIES, S.A. and COMMISSERIAT À L'ÉNERGIE ATOMIQUE,	)	
Plaintiffs,	)	
v.	)	Civ. No. 08-292-SLR
MEMC ELECTRONIC MATERIALS, INC.,	)	
Defendant.	)	

Denise Seastone Kraft, Esquire and John L. Reed, Esquire of Edwards Angell Palmer & Dodge LLP, Wilmington, Delaware. Counsel for Plaintiffs. Of Counsel: George W. Neuner, Esquire, Alan M. Spiro, Esquire, Brian M. Gaff, Esquire and Carolyn Gouges d'Agincourt, Esquire, of Esquire of Edwards Angell Palmer & Dodge LLP, Boston, Massachusetts; Michael L. Brody, Esquire of Winston & Strawn LLP, Chicago, Illinois; Gail J. Standish, Esquire of Winston & Strawn LLP, Los Angeles, California; and Marcus T. Hall, Esquire and Laura K. Carter, Esquire of Winston & Strawn LLP, San Francisco, California.

Patricia Smink Rogowski, Esquire of Connolly Bove Lodge & Hutz LLP, Wilmington, Delaware. Counsel for Defendant. Of Counsel: Robert M. Evans, Jr., Esquire, David W. Harlan, Esquire, Marc W. Vander Tuig, Esquire, B. Scott Eidson, Esquire and Richard L. Brophy, Esquire of Senninger Powers LLP, St. Louis, Missouri.

MEMORANDUM OPINION

Dated: October 13, 2010
Wilmington, Delaware

Dockets.Justia.com

TABLE OF CONTENTS

I. INTRODUCTION 1
II. BACKGROUND 2
A. The Parties 2
B. Technology Overview 3
III. STANDARD 3
IV. DISCUSSION 5
A. The Bruel Patent 5
1. Disclosure 5
2. Prosecution history 6
3. Infringement: mono- and co-implantation 10
4. Written description: temperature limitations 12
5. Conclusion: the Bruel patent 14
B. The Aspar Patents 14
1. Specification 15
2. The asserted claims 17
3. Infringement: mono- and co-implantation 23
4. Validity 24
a. The ‘396 patent: certificate of correction 24
(1) Standard 24
(2) Discussion 25
b. The ‘234 patent: indefiniteness 28
(1) Standard 28
(2) Discussion 28
c. The ‘009 patent: claim construction in view of Bruel 31
(1) “Bridges” 31
(2) “Mechanical forces” 34
d. The ‘009 patent: anticipation by Bruel 36
(1) Standard 36
(2) Discussion 36
e. The ‘009 patent: obviousness in light of Bruel 38
(1) Standard 38
(2) Discussion 40
f. The ‘009 patent: anticipation by the ‘252 patent 41
g. The ‘009 patent: written description 42
h. The ‘009 patent: best mode 44
5. Inequitable conduct 46
a. Standard 47
b. Facts 50
c. Discussion 53
6. Conclusion: the Aspar patents 57
C. The ‘812 Patent 57
1. Disclosure 57
2. Prosecution history 60
3. Claim construction 63

4. Validity 66
a. Enablement 66
(1) Standard 66
(2) Discussion 68
b. Obviousness 70
5. Infringement 72
a. The accused products 72
b. SOI/BESOI wafers 75
c. “Bonded”/ “On” 76
d. Generally annular recess 78
6. Conclusion: the ‘812 patent 80
V. CONCLUSION 81

ROBINSON, District Judge

I. INTRODUCTION

Plaintiffs S.O.I.TEC Silicon On Insulator Technologies, S.A. ("Soitec") and Commissariat à L'Énergie Atomique ("CEA") (collectively, "plaintiffs") filed their complaint against MEMC Electronic Materials Inc. ("MEMC" or "defendant") on May 19, 2008, alleging infringement of U.S. Patents No. RE 39,484 ("the Bruel patent"), as well as U.S. Patent Nos. 6,809,009 ("the '009 patent") and 7,067,396 ("the '396 patent"). (D.I. 1) In lieu of an answer, defendant moved to dismiss the complaint, which motion was denied by the court on February 20, 2009. (D.I. 16) Defendant thereafter answered and brought, *inter alia*, counterclaims for infringement of U.S. Patent No. 5,834,812 ("the '812 patent"), as well as for a declaration of noninfringement of several unasserted patents. (D.I. 19) Plaintiffs moved to dismiss defendant's counterclaims relating to the unasserted patents but, subsequently, withdrew the motion. (D.I. 30, 48) Plaintiffs filed an amended complaint on July 21, 2009 adding a claim for infringement of U.S. Patent No. 7,498,234 ("the '234 patent"). (D.I. 57) The court granted defendant's subsequent motion to bifurcate the issues of willfulness and damages for purposes of discovery and trial (D.I. 77), and denied plaintiffs' cross-motion to bifurcate the issues of intervening rights and inequitable conduct (D.I. 85). Fact and expert discovery have now closed.

Currently before the court are ten motions for summary judgment. Defendant has moved for partial summary judgment of invalidity of the asserted claims of the '009, '396 and '234 patents (collectively, the "Aspar patents") and for noninfringement of the Bruel and Aspar patents. (D.I. 187; D.I. 199) Plaintiffs have filed eight motions for

summary judgment, seeking: (1) summary judgment of noninfringement of the ‘812 patent (D.I. 197); (2) summary judgment that the Bruel and Aspar patents satisfy the written description requirement (D.I. 202); (3) partial summary judgment that the certificate of correction issued for the ‘396 patent is valid (D.I. 204); (4) partial summary judgment that the Aspar patents are not unenforceable due to inequitable conduct (D.I. 206); (5) partial summary judgment that the Bruel patent does not anticipate the Aspar patents (D.I. 208); (6) partial summary judgment that the ‘812 patent is invalid for lack of enablement (D.I. 210); (7) partial summary judgment that the ‘812 patent is invalid in view of certain prior art (D.I. 212); and (8) partial summary judgment that the best mode requirement is satisfied for the claims of the ‘009 and ‘396 patents (D.I. 213). Also before the court are two motions in limine. (D.I. 141, 186) Oral argument was heard on September 3, 2010 and this matter is currently scheduled for trial commencing on October 25, 2010. The court has jurisdiction over these matters pursuant to 28 U.S.C. § 1338.

II. BACKGROUND

A. The Parties

Soitec is a French company and a leading developer of silicon-on-insulator semiconductor (“SOI”) wafers. CEA is the French Atomic Energy Commission, which operates a research facility known as the Laboratory of Electronics and Information Technologies in Grenoble, France. CEA is the owner of the ‘484 and Aspar patents, which are exclusively licensed to Soitec.[1] MEMC is a Delaware corporation having a

---

[1]For ease of reference, the court referrs to “Soitec” synonymously with “plaintiffs” and as the owner of the Bruel and Aspar patents throughout its opinion.

principal place of business in St. Peters, Missouri, and is also in the SOI business.

B. Technology Overview

Semiconductor films, also referred to as wafers, are a thin slice of semiconductor material, such as silicon crystal, used in the manufacture of microelectronic devices. Semiconductor wafers are made of nearly defect-free single crystalline material. Single-crystal silicon has been haled as one of the most important technological materials of the last decades.

SOI wafers contain three layers: a top, "active" layer of high-quality silicon (the "wafer"); a buried layer of electrically-insulating silicon dioxide (the "BOX" layer);[2] and a silicon support layer (also called the "handle" or "handle wafer"). That is, two silicon wafer layers surround the BOX layer. The BOX layer is an electrical insulator; it keeps electrons flowing efficiently without letting stray electrons leak into the silicon substrate. As a result, junction capacitance (the electric charge temporarily stored where the regions meet) is reduced, electrons get to their destinations faster and device performance is increased.[3] SOI wafers may perform with 30-40% less power input (with less error rate) than their bulk-silicon predecessors.[4]

III. STANDARD

A court shall grant summary judgment only if "the pleadings, depositions, answers to interrogatories, and admissions on file, together with the affidavits, if any,

---

[2]Shorthand for "buried oxide."

[3]*See, gen.,* http://www.soiconsortium.org/pdf/SOI_Implementation_WhitePaper_Infotech_v2.pdf.

[4]*See, gen.,* http://www.soiconsortium.org/pdf/Consortium_9april09_final.pdf.

show that there is no genuine issue as to any material fact and that the moving party is entitled to judgment as a matter of law." Fed. R. Civ. P. 56(c). The moving party bears the burden of proving that no genuine issue of material fact exists. *See Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574, 586 n.10 (1986). "Facts that could alter the outcome are 'material,' and disputes are 'genuine' if evidence exists from which a rational person could conclude that the position of the person with the burden of proof on the disputed issue is correct." *Horowitz v. Fed. Kemper Life Assurance Co.*, 57 F.3d 300, 302 n.1 (3d Cir. 1995) (internal citations omitted). If the moving party has demonstrated an absence of material fact, the nonmoving party then "must come forward with 'specific facts showing that there is a genuine issue for trial.'" *Matsushita*, 475 U.S. at 587 (quoting Fed. R. Civ. P. 56(e)). The court will "view the underlying facts and all reasonable inferences therefrom in the light most favorable to the party opposing the motion." *Pa. Coal Ass'n v. Babbitt*, 63 F.3d 231, 236 (3d Cir. 1995). The mere existence of some evidence in support of the nonmoving party, however, will not be sufficient for denial of a motion for summary judgment; there must be enough evidence to enable a jury reasonably to find for the nonmoving party on that issue. *See Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 249 (1986). If the nonmoving party fails to make a sufficient showing on an essential element of its case with respect to which it has the burden of proof, the moving party is entitled to judgment as a matter of law. *See Celotex Corp. v. Catrett*, 477 U.S. 317, 322 (1986).

IV. DISCUSSION

A. The Bruel Patent

1. Disclosure

There are several methods for producing SOI wafers. For example, as described in the Bruel patent, silicon crystal films may be grown on a monocrystalline substrate ("heteroepitaxy" methods). (Bruel patent, col. 1:25-29) Another method for forming a monocrystalline film is by an oxygen ion implant of the wafer followed by thermal treatment (often referred to as "SIMOX"[5]). (*Id.*, col. 1:30-34) "Other processes make use of the principle of thinning a wafer by chemical or mechanical abrasion." (*Id.* at col. 1:35-45) One common such process is known as "etch-stop," whereby the thinning of a wafer is controlled by a chemical process based on the different etching potentials of n-type and p-type[6] silicon layers in etching solutions. (*Id.*)

The Bruel patent describes several disadvantages to these common methods.[7] For example, heretoepitaxy methods are limited by the nature of the substrates, which are also expensive and fragile. (*Id.*, col. 1:55-60) The high dose ion implantation of the SIMOX method is performed on complex implantation machines with limited output.

---

[5]An acronym for "separation by implantation of oxygen."

[6]Generally, positively ("p-type") and negatively ("n-type") charged semiconductors are obtained through the process of doping, or adding certain types of atoms to the semiconductor to increase the number of free charge carriers (to positive or negative). The resolution of the motions at bar does not necessitate a review of the science of doping or the movement of electrons between energy levels.

[7]The Bruel patent is entitled "Process for the production of thin semiconductor material films." It originally issued as U.S. Patent No. 5,374,564 ("the '564 patent") and was reissued on February 6, 2007 as RE 93,484. Priority is claimed to a French application dated September 18, 1991.

(*Id.*, col. 1:62-65) Etch-stop “makes the process complex and in certain cases can limit the use of the film,” for example, where it is produced by p-type doping, the electronic device would have to adapt to the p-type nature of the film. (*Id.*, col. 1:66-col.2:6)

The Bruel process avoids these stated disadvantages, and consists of three distinct stages. The first step is implantation by bombardment, whereby a layer of gaseous microbubbles (defining in the volume of the wafer an upper and lower area that will eventually be separated) is forced into the silicon substrate. (*Id.*, col. 2:26-37) This preferably occurs at an implantation temperature between 20° and 450° C. (*Id.* at col. 3:9-19) Coalescence of the microbubbles in this layer, along with crystalline rearrangement, ultimately causes separation between the film and substrate during the third process stage of heat treatment. (*Id.* at col. 3:20-26) In the second stage, a stiffner having at least one rigid layer is contacted to the face of the wafer. (*Id.* at col. 2:38-40) The stiffner compensates for the stresses produced by the microbubbles occurring during the final heat treatment phase, which would otherwise cause surface deformation and blistering. (*Id.* at col. 3:27-43) Accordingly, the stiffner cannot be incorporated at a temperature that would trigger the third stage procedures. (*Id.* at col. 4:19-21) In the third, heat treatment stage, the wafer (with stiffner) undergoes a thermal treatment at a temperature sufficient to cause crystalline rearrangement and coalescence of the microbubbles (above approximately 500° C), i.e., separation of the film and substrate. (*Id.*, col. 4:22-31)

2. Prosecution history

The Bruel patent is a reissue patent. U.S. Patent No. 5,374,564 (“the ‘564

patent") was issued by the PTO on December 20, 1994. The '564 patent claimed a process for the preparation of thin semiconductor films comprising a first implantation stage involving "ion bombardment," the "ions being chosen from among hydrogen gas ions or rare gas ions," a second contacting step and a third, thermal treatment step. In 1999, Soitec sued Silicon Genesis ("SiGen") for infringement of the '564 patent (hereinafter, the "*SiGen*" litigation); the jury found all but one asserted claim of the '564 invalid as not enabled with respect to the implantation step. Specifically, the '564 patent taught only implantation of hydrogen ions, not additionally the rare earth gas ions (helium, neon, argon, krypton and xenon) claimed. The Federal Circuit affirmed, stating that the jury had before it substantial evidence that "hydrogen ions are significantly different than other rare earth gases in mass, bonding capability and diffusion characteristics" and, therefore, Soitec's disclosure enabling only hydrogen was insufficient. *See Soitec, S.A. v. Silicon Genesis Corp.*, 81 Fed. Appx. 734, 738-39 (Fed. Cir. 2003) (unpublished).

In May 2003, CEA filed reissue proceedings, adding nineteen (19) new claims for consideration. Several such new claims, and subsequent amendments to existing claims, were drawn to a first implantation stage by hydrogen or helium ions. (JA-1688-89; JA-1787-96)[8] The examiner issued a § 251 rejection, as follows:

> Regarding claims 1-3, 5-15, 22, 33-38, 40 and 41-44, the claims are broadening because of the newly added limitations requiring implantation of "a combination of hydrogen gas ions and rare gas ions" (claims 1, 11-14, and 41) or "hydrogen ions in combination with rare gas ions" (claims 22 and 40) or "hydrogen and

---

[8]The court has before it the briefing on twelve motions and thousands of pages of related appendices. For efficiency, the court will cite to the parties' exhibits without specific reference to the docket.

> helium ion bombardment" (claim 33). These features are broadening because they contain within their scope any conceivable product or process – i.e. implantation of the combination of hydrogen and rare gas ions – which would have infringed the original patent because hydrogen is implanted. Alternatively, in the context of the claims, the implantation of the combination of hydrogen and rare gas ions would infringe the reissue claim, but not infringe the original patent because the original patent claim 1 implants hydrogen gas ions or rare gas ions. The remaining [dependant] claims are [also] rejected[.]

(JA-1843) An enablement rejection was also entered, stating:

> [The foregoing claims are also] rejected . . . as failing to comply with the enablement requirement. The claims contain subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. . . [T]he claims lack enablement because the disclosure fails to provide an enabling basis for practicing the invention with rare gas ions alone (i.e. implantation of helium in claims 27-32) or in combination with hydrogen (claims 1-3, 5-15, 22, 33-38, 40 and 41-44).

(JA-1844-45) The examiner further noted the unpredictability of the chemical arts and that compliance with the enablement requirement is most important in this area of technology. (JA-1845)

In response, the applicants argued that the specification enabled implanting hydrogen in combination with helium or other gas ions by disclosing that,

> [i]n the performance of the process according to the invention, the ions used for implantation by bombardment are usually H+ ions, but this choice must not be looked upon as limitative. Thus, the principle of the method is applicable with molecular hydrogen ions or with ions of rare gases such as helium, neon, krypton and xenon, used either sparingly or in combination.

(JA-1877-81) (citing '564 patent, col. 4:38-44) Given this disclosure, as well as the "extensive literature on rare gas implantation of semiconductors and metals, the applicant assert[ed] that one skilled in the art could have made the necessary adjustments based on routine experimentation to practice the invention using any one

or all of the recited gas ions as of the '564 patent filing date."[9] (JA-1879) The examiner disagreed, and issued a rejection on enablement based on res judicata in view of the Federal Circuit's *SiGen* decision. (JA-2181-85) ("[A] reissue application is not the proper forum in which to submit different evidence regarding rare gases implantation that could have been submitted and considered during litigation.")

In response, the applicants cancelled some claims, added sixty (60) new claims, and narrowed all pending claims to mono-implantation of hydrogen; language encompassing co-implantation of hydrogen and helium (or other rare gas ions) was removed. (JA-2199-2235) A notice of allowability was thereafter issued in which the examiner noted that "the applicant has amended the claims to pertain to only hydrogen and the claims no longer include rare gas ions (which was held to be invalid by the Federal Circuit Court of Appeals). Therefore, the applicant has **narrowed** the scope of all claims and no broadening has occurred." (JA-2368) (emphasis in original) A third-party protestor thereafter argued that the claims should be limited to "consisting" (rather than "comprising") to prevent any future broadening attempts. (JA-2293-97) The examiner disagreed that such amendment was necessary:

> Prosecution history estoppel (file wrapper estoppel), collateral estoppel and res judicata all function to make clear **that the applicant's claims are limited to hydrogen ions**. Due to these doctrines and the current application's well-established record, the examiner does not believe that any further amendments are necessary on behalf of the applicant to further clarify this resolved issue.

(JA-2370) (emphasis in original) The Bruel (reissue) patent issued on February 6, 2007. Michel Bruel ("Bruel") is the sole named inventor.

---

[9] Commensurate with this response, six new claims directed to co-implantation were also added to the reissue application. (JA-1870-71)

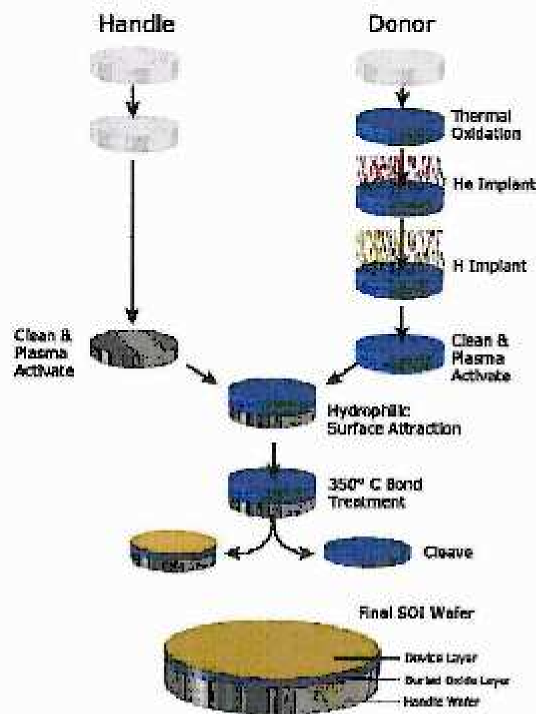
3. Infringement: mono- and co-implantation

The foregoing prosecution history informs the court's determination that the claims of the Bruel patent must be limited to hydrogen ions. Remarkably, it is Soitec's position that the claims include the referenced hydrogen ion bombardment, but may also include additional steps of bombardment with other gases, evidenced by the use of the term "comprising." This is precisely the situation envisioned by the third party protestor, leading the foregoing comments by the examiner. The "ions" versus "hydrogen ions" issue has been thoroughly vetted before the PTO (and, in the context of the Bruel patent, presented to the Federal Circuit). Soitec's arguments at bar strain credulity. *See, e.g., Computer Docking Station Cor. v. Dell, Inc.*, 519 F.3d 1366, 1379 (Fed. Cir. 2008) (plaintiffs "cannot recapture claim scope disavowed during prosecution"); *Bd. of Regents of the Univ. of Texas Sys. v. BENQ Am. Corp.*, 533 F.3d 1362, 1373 (Fed. Cir. 2008) (plaintiffs "cannot rely on the word 'comprising' to broaden the scope of a claim phrase that was limited during prosecution so as to gain allowance of the patent.").

Since the Bruel patent claims may not be interpreted as covering more than the mono-implantation of hydrogen ions, the court finds that MEMC's current manufacturing process cannot infringe asserted claim 50. The parties do not dispute that MEMC implants its wafers first with helium, then with hydrogen ions during the layer transfer process, as depicted in the following diagram.[10] (D.I. 250 at 9)

---

[10]As represented in Soitec's papers, MEMC's primary helium dose is in the range of 1.0×10^{16} He ions cm^{-2}, and at an energy of 36 keV. The subsequent hydrogen dose is carried out at about 0.5×10^{16} H_2 ions cm^{-2}, at an energy of 48 keV, and at a temperature of approximately 37-50 C. (D.I. 250 at 9)



(MA-0209) Soitec disputes whether this one-after-another technique is truly a "co-implant" (*id.*), but infringement in this case does not turn on such classifications. MEMC's process is not limited to hydrogen implantation and, therefore, it is outside the scope of the Bruel patent claims.[11] In view of the court's holding, the court need not

---

The parties agree that MEMC began using this process in June 2006, prior to the issuance of the Bruel '484 patent. (D.I. 200 at 12; D.I. 250 at 11)

[11]Prosecution history estoppel precludes Soitec from arguing that MEMC infringes claim 50 of the Bruel '484 patent under the doctrine of equivalents. Narrowing a claim in response to a § 112 rejection results in a surrender of the broader subject matter. *See Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Ltd.*, 535 U.S. 722, 736-37 (2002) ("[I]f a § 112 amendment is necessary and narrows the patent's scope – even if only for the purpose of better description – estoppel may apply. . . . A patentee who narrows a claim as a condition for obtaining a patent disavows his claim to the broader subject matter, whether the amendment was made to avoid the prior art or to comply with § 112.").

separately evaluate whether MEMC's "low-temperature" (room temperature corresponding to the second stage of claim 50, or 350° C or less for the third stage) process parameters meet the remaining limitations.

4. Written description: temperature limitations

Soitec moves for partial summary judgment that the Bruel patent satisfies the written description requirement of 35 U.S.C. § 112. (D.I. 202) It is MEMC's position that the Bruel patent unequivocally identifies 500° C as the minimum temperature required for the third stage when the implanted substrate is silicon. (D.I. 243 at 7) MEMC, therefore, asserts that, given this teaching and the lack of any examples of practicing the claimed process at a temperature under 500° C, one of ordinary skill in the art would understand that Bruel did not possess a process using thermal treatments below 500° C as of the priority date. (*Id.*) The issue is one of claim construction.

Soitec asserts that claim 50 of the Bruel patent, specifically, the "thermally treating. . . at a temperature. . . adequate to create by a crystalline rearrangement effect in the wafer and a pressure effect in the hydrogen microbubbles" limitation correlating to the third stage, should be construed to cover "any third stage temperature that allows for crystalline rearrangement and coalescence of the bubbles." (D.I. 155 at 2; D.I. 203 at 11) In support for limiting the claims to "at least 500° C" for the third stage, MEMC points to the specification, which states that the

> heat treatment **must**, according to the invention, be carried out at a temperature at which the crystalline rearrangement and coalescence of the microbubbles can effectively take place. **For example**, in the case of silicon, a temperature above **approximately** 500° C is **necessary**[.]

(Bruel patent, col. 4:24-29) (emphasis added) During prosecution of the '564 patent,

Bruel provided a declaration by Dr. Kevin S. Jones, a Ph.D. in Materials Science and Engineering, stating that "one could begin the annealing study in the 500° C - 700° C range where atomic motion in silicon is often observed to begin." (MA-1283-84) In the later-filed Aspar patents, Bruel (and the other named inventors of the Aspar patents) stated that, for the third step, "[t]his temperature is, for example[,] 500° C for silicon." ('009 patent, col. 1:53-54) MEMC does not point to any statements made during the reissue proceedings that may bear on this issue. (D.I. 167 at 15-18)

The court finds the foregoing insufficient to limit claim 50 to "at least 500° C" for the third stage. (D.I. 155) There is no temperature limitation in the claims. There is no clear and unmistakable disclaimer of claim scope of record. *See Cordis Corp. v. Boston Scientific Corp.*, 561 F.3d 1319, 1329 (Fed. Cir. 2009). "[A]bsent a clear disclaimer of particular subject matter, the fact that the inventor may have anticipated that the invention would be used in a particular way does not mean that the scope of the invention is limited to that context." *Martek Biosciences Corp. v. Nutrinova, Inc.*, 579 F.3d 1363, 1382 (Fed. Cir. 2009) (citations omitted). Although MEMC argues that Bruel did not have possession of a process comprising a third stage temperature of below 500° C, MEMC does not point to expert testimony that third stage treatments below 500° C would not have been known to a person of ordinary skill in the art (or discernable to such a person without undue experimentation). *See Martek*, 579 F.3d at 1378.[12] Under the circumstances at bar, the court applies the general rule that particular embodiments appearing in the specification will not be read into the claims.

---

[12]MEMC criticizes Soitec's proffered expert testimony on the matter as conclusory, but proffers none of its own. (D.I. 243 at 12-13)

Having rejected MEMC's claim construction, Soitec's motion for partial summary judgment that claim 50 of the Bruel patent is not invalid for lack of written description is granted.[13]

5. Conclusion: the Bruel patent

To summarize: (1) MEMC's motion for summary judgment of noninfringement (D.I. 199) is granted with respect to the Bruel patent; and (2) Soitec's motion that the patents in suit satisfy the written description requirement (D.I. 202) is also granted with respect to the Bruel patent. The court proceeds to discuss the pending motions relating to the Aspar patents.

B. The Aspar Patents

The Aspar patents are entitled "Method for producing a thin layer of semiconductor material" and name Bruel, Bernard Aspar ("Aspar"), and Thierry Poumeyrol ("Poumeyrol") as inventors. The Aspar patents share a common specification and are related continuation applications in a chain. The first United States patent in the Aspar patent family is U.S. Patent No. 6,020,252 ("the '252 patent"), which was filed on May 14, 1997 and issued February 1, 2000.[14] The '252 patent describes processes for producing a thin layer of semiconductor material by (1) implanting (2) hydrogen or rare gas ions (3) into a semiconductor material substrate.

---

[13] The court need not resolve, for purposes of the motion at bar, the issue of claim construction with respect to the "thermally treating. . . at a temperature. . . adequate to create by a crystalline rearrangement effect in the wafer and a pressure effect in the hydrogen microbubbles" limitation. The court notes MEMC's argument that Soitec's construction is indefinite.

[14] Priority is claimed to a French patent application (96 06086) filed May 15, 1996.

Claims are drawn to subjecting a semiconductor wafer to “implantation” by bombardment by “ions of a rare gas or hydrogen.”

A continuation application (No. 09/299,683) was filed claiming priority to the ‘252 application on April 26, 1999, which eventually matured into U.S. Patent No. 6,225,192 (“the ‘192 patent”). The ‘192 patent similarly claims a method of producing a thin layer of semiconductor material by subjecting a wafer to implantation with “a rare gas or hydrogen,” subjecting it to a thermal treatment, and then applying a mechanical energy to separate regions.

The ‘009 patent was filed on February 6, 2001 as a continuation from the ‘192 patent; it issued October 26, 2004. The ‘396 patent was filed as a continuation from the ‘009 patent application, filed February 23, 2004, and issued June 27, 2006. The ‘234 patent was filed as a continuation of the ‘396 patent application on January 9, 2006, and issued March 3, 2009. As continuations, the Aspar patents share a common specification that describes a method for forming thin-layer SOI films.

1. Specification

The invention provided in the Aspar patents is stated to be an improvement over the process of the ‘564 patent. As is the case with most improvement patents, there is overlap between the ‘564 patent and the Aspar patents. For example, both describe a first ion bombardment phase sufficient to create microcavities. The ‘564 patent disclosed an implant temperature of lower than 500° C, preferably within the 20° - 450° C range for silicon. (Bruel patent, col. 3:9-19) The Aspar patents provide that, in the case of implantation of hydrogen ions in silicon, “the implantation will be carried out at a temperature below 350° C.” (*Id.*, col. 4:47-49) It is a most “important feature” of the

Aspar patents' invention that the implantation step occurs at a dose and temperature insufficient to cause separation. (*Id.*, col. 4:7-17; 4:43-46; 4:50-60)

After the ion implantation step in Bruel, a stiffner is attached to the face surface. A stiffner (or "support") is attached only optionally in the Aspar process, and this occurs after the second Aspar process step – an intermediate thermal treatment step. ('009 patent, col. 3:41-56) This intermediate thermal treatment step is necessary because, at the temperature of the final heat treatment stage of Bruel, undesirable blisters and craters form in the surface of the silicon wafer. (*Id.*, col. 2:13-33) The creation of electronic circuits in or at the wafer surface "implies the carrying out of certain classic micro-electronics operations . . . that require thermal treatment stages (typically from 400° C to 700° C)" at which temperature the blisters form. (*Id.*) These surface defects render it difficult to bring the flat face of the wafer with the support so as to detach the semiconductor layer from the rest of the wafer. (*Id.*)

The Aspar patents provide for an intermediate step between ion implantation and separation, whereby "the part of the wafer corresponding to the future thin layer [is thermally treated,] in particular between 400° C and 700° C for silicon, without degrading the surface condition of the flat face of the wafer and without separation of the thin layer." (*Id.*, col. 2:36-41) This intermediate step occurs "at a temperature that is sufficient to allow coalesce of the microcavities along the reference plane," for example, 550° C if the ion implantation step occurred at 350° C. (*Id.*, col. 5:1-14; fig. 2) This allows for the optional step of providing an electronic component on the wafer before the thin layer is formed. (*Id.*, col. 2:41-43; 3:41-45; fig. 3) Bruel, by contrast,

"does not allow the production of electronic circuits in or at the surface of the flat face of the wafer after the ion implantation step." (*Id.*, col. 1:19-54; col. 2:5-10)

The "thermal treatment" step of Bruel, whereby the wafer with stiffner attached are subjected to temperatures (above approximately 500° C) to achieve the crystalline rearrangement resulting in separation, corresponds to the final "separation step" disclosed by the Aspar patents. This third step consists of separating the wafer into two parts by "the application of mechanical forces between the two parts of the wafer." (*Id.*, col. 3:5-9) Put another way, because of the intermediate thermal step, whereby only partial separation occurs between the wafers allowing for the possible incorporation of electronics, "the separation requires an extra step of applying mechanical forces." (*Id.*, col. 3:34-35) The separation step "consists of applying separating mechanical forces, for example, tensile forces between the parts of the wafer or substrate situated on each side of the reference plane in a manner that fractures the remaining solid bridges" between wafer segments and between the microbubbles. (*Id.*, col. 5:51-55; fig. 4) As noted above, it is preferable to affix the wafer to a "support or applicator" (e.g., stiffener) prior to this step, "through which mechanical [separation] forces such as tensile and/or shearing forces will be applied." (*Id.*, col. 3:49-53; 6:3-10)

2. The asserted claims

The court's discussion of the scope of the claims at issue is best framed by a brief discussion of the prosecution history. The application that matured into the '009 patent, U.S. Patent Application No. 09/777,516 ("the '516 application"), contained original claims drawn to a process comprising "introducing ions into the first substrate."

(MA-1010-12) On September 23, 2003, PTO Examiner George Fourson rejected the claims for lack of enablement. (MA-0934) On February 23, 2004, the applicants narrowed the claims to “introducing **hydrogen** ions,” and the application was thereafter allowed (on May 25, 2004). (MA-0937)

Claim 1 of the ‘009 patent claims

1. A method for producing a thin film comprising:

providing a first substrate having a face surface;

introducing hydrogen ions into the first substrate at the face surface, such that microcavities are formed in the first substrate during or after introducing the ions, wherein the microcavities define a thin film layer extending from the first surface to the microcavities, the microcavities reside between solid bridges of the first substrate, and the hydrogen ions are introduced into the first substrate at a temperature and at a total amount so as not to fracture the solid bridges during energizing of the first substrate;

bonding a second substrate to the face surface of the first substrate; and

applying mechanical forces to fracture the solid bridges.

(‘009 patent, claim 1) Claim 4 is asserted by Soitec against MEMC, which depends from claim 2 (further depending from claim 1) and additionally requires applying energy to the first substrate after introducing hydrogen ions.

On February 23, 2004, the same day the ‘009 patent claims were narrowed to hydrogen ions prior to allowance, the applicants filed U.S. Application No. 10/784,601 (“the ‘601 application”) as a continuation of the ‘516 application; the ‘601 application was also assigned to Examiner Fourson. The ‘601 application would later issue as the ‘396 patent. As filed, the ‘601 application claimed a process including “an ion implantation step consisting of bombarding said flat face [of the wafer] with ions chosen from among the ions of rare gases or of hydrogen.” (JA-0293) Claims 1 to 12 were

then pending. A preliminary amendment was commensurately filed cancelling claims 1 to 12 and adding new claims 13 to 20, drawn to a process comprising "introducing ions into the first substrate." (JA-0328-29; JA-405-06)

It appears as though a rendition of the pending claims in the '601 application, as well as a list of the claims in the copending '516 application, were concurrently faxed to Examiner Fourson on June 3, 2004 and included in the '601 application file wrapper. In the '601 application file, with a fax header dated June 3, 2004, appears a copy of the February 23, 2004 preliminary amendment (in the '601 application) as well as several pages of claims from the **'516** application, which had been allowed on May 25, 2004. (JA-0408-10) This claim listing from the '516 application contained claims 13 to 28 (sixteen claims). The pages correlate to an amendment filed in the '516 application on February 25, 2004, accompanying a request for continued examination, in response to a final rejection by Examiner Fourson in that case. (*Compare* JA-0155-57 with JA-0408-10) In that amendment, the independent claims of the '516 application were amended to add, inter alia, the "hydrogen ion" limitation. For example,

Claim 13 (currently amended): A method for producing a thin film comprising:

providing a first substrate having a face surface;

introducing hydrogen ions into the first substrate at the face surface, such that microcavities are formed in the first substrate during or after introducing the ions, wherein the microcavities define a thin film layer extending from the first surface to the microcavities, ~~and wherein~~ the microcavities reside between solid bridges of the first substrate, and the hydrogen ions are introduced into the first substrate at a temperature and at a total amount so as not to fracture the solid bridges during energizing of the first substrate;

bonding a second substrate to the face surface of the first substrate; and

applying mechanical forces to fracture the solid bridges.

(JA-0408)

In September 2005, having not received a first action on the merits in the ‘601 application, the applicants filed a status request with the PTO. (JA-0467) On September 22, 2005, a Notice of Allowability of claims “13 to 28” was issued. (JA-0498) The examiner’s reasons for allowance stated that the application was allowable “for the reasons stated in the parent application [the ‘516 application, then issued as the ‘009 patent] and because the prior art taken alone or in combination is not seen to disclose or suggest implantation parameters sufficient to form the microcavities having the recited properties. Also, claims 23 and 27 are seen to recite a dose between $1x10^{16}$ and $4x10^{16}$ ions/cm^{-2}.” (JA-0499)

The claims pending in the ‘601 application at the time the application was allowed (September 22, 2005) were as reflected by the preliminary amendment dated February 23, 2004: claims 13 to 20, with independent claim 13 reading as follows.

> **Claim 13 (new):** A method for producing a thin film comprising:
>
> providing a first substrate having a face surface;
>
> introducing ions into the first substrate at the face surface, such that microcavities are formed in the first substrate during or after introducing the ions, wherein the microcavities define a thin film layer extending from the first surface to the microcavities, and wherein the microcavities reside between solid bridges of the first substrate;
>
> bonding a second substrate to the face surface of the first substrate; and
>
> applying mechanical forces to fracture the solid bridges.

On October 11, 2005, the applicants sent a "request for clarification of [the] notice of allowability" noting that claims "13 to 28" had been allowed, but only claims "13 to 20" are pending in the application; similarly, the examiner's reference to claims 23 and 27 "is confusing." (JA-0506) On December 20, 1995, the applicants filed an amendment after the notice of allowance pursuant to Rule 312. The amendment referred to claims 1-12 as cancelled, provided pending claims 13-20, and presented an amendment to independent claim 13 only. Specifically, the claim was changed from reading "wherein the microcavities define a thin film layer extending from the **first** surface to the microcavities" to now read, "extending from the **face** surface." (JA-0509) The pending claims remained drawn to an ion implantation step whereby "ions" are introduced to the first substrate at the face surface. (*Id.*)

The issue fee was paid, and the examiner thereafter entered the applicants' amendment on January 18, 2006. (JA-0513) Another status request was filed by the applicants on April 27, 2006. (JA-0516) In May 2006, the examiner sent a status letter stating that the application "was forward[ed] to TC to have an amendment entered[;] the application will be reforwarded back to pub[lication] after the amendment has been

entered in the application." (JA-0517)

The '601 application issued as the '396 patent on June 27, 2006. Sixteen claims are printed on the face of the '396 patent, which claims correlate to (formerly pending) claims 13 to 28 of the **'516** application. On October 30, 2006, the applicants filed a "petition for certificate of correction" which the applicants stated was "required to correct significant printing errors" in the '396 patent. (JA-0519-20) By that certificate of correction, which was duly entered by the PTO, the following changes to the claims of the '396 patent were effectuated: (1) claims 9-16 were deleted entirely; (2) "hydrogen" was deleted from independent claims 1 and 8; and (3) the "temperature and total amount" limitation was also deleted. The claims of the '396 patent were effectively transformed to originally-pending claims 13 to 20 of the '601 application.

Claim 1 of the '396 patent reads, as corrected:

1. A method for producing a thin film comprising:

providing a first substrate having a face surface;

introducing ions into the first substrate at the face surface, such that microcavities are formed in the first substrate during or after introducing the ions, wherein the microcavities define a thin film layer extending from the face surface to the microcavities, and wherein the microcavities reside between solid bridges of the first substrate;

bonding a second substrate to the face surface of the first substrate;

and applying mechanical forces to fracture the solid bridges.

Claim 4 is asserted by Soitec as infringed by MEMC, which depends from claim 2 (further depending from claim 1) and contains the additional limitation that energy is applied to the first substrate after the introduction of ions.

The prosecution history of the '234 patent is unremarkable for the purposes of

the motions at bar. Claim 24 is asserted by Soitec, which depends from claim 21, reading:

> 21. A method for producing a thin film comprising the steps of:
>
> implanting hydrogen ions into a semiconductor material substrate through a face thereof so as to form a layer of microcavities with bridges connecting a thin film layer of desired thickness to a remaining portion of the semiconductor material substrate, the quantity of ions in the layer of microcavities being insufficient to produce fracture of the bridges throughout the layer of microcavities by a subsequent thermal annealing alone;
>
> conducting a subsequent thermal annealing of the semiconductor material substrate at sufficiently low temperature to substantially limit diffusion of gas from the semiconductor material substrate;
>
> and effecting the propagation of bridge fracture to sever the thin film layer from the remaining portion of the semiconductor material substrate through the application of an additional mechanical force.

Claim 24 adds an additional limitation that effecting the propagation of bridge fracture comprises a process carried out after thermal annealing of the semiconductor material substrate.

3. Infringement: **mono- and co-implantation**

MEMC moves for summary judgment of noninfringement with respect to the Aspar patents. (D.I. 199) As discussed previously in the context of the Bruel patent, MEMC employs a helium implant prior to a hydrogen implant in its process. The claims of the ‘009 patent were narrowed to hydrogen atons in response to an enablement rejection. (MA-0934; MA-0937) As such, the broader subject matter was surrendered and MEMC cannot infringe. Prosecution history estoppel precludes Soitec from arguing that MEMC infringes claim 24 of the ‘234 patent under the doctrine of equivalents. *See Festo Corp.*, 535 U.S. at 736-37.

4. Validity

MEMC has moved for summary judgment of invalidity of each of the asserted Aspar patent claims. The court addresses MEMC's arguments in turn.

a. The '396 patent: certificate of correction

The court takes up the issue of the validity of the '396 patent on cross-motions: Soitec moves for partial summary judgment that the certificate of correction for the '396 patent is valid (D.I. 204); and MEMC moves for summary judgment of invalidity on the same ground (D.I. 187).

(1) Standard

Two statutory sections govern certificates of correction, 35 U.S.C. §§ 254 and 255. Section 254 controls in situations where the PTO has made a mistake.[15] This case presents a question of review with respect to an applicant-initiated certificate of correction which is addressed by section 255, governing mistakes by the applicant:

> Whenever a mistake of a **clerical or typographical** nature, or of **minor character**, which was not the fault of the Patent and Trademark Office, appears in a patent and a showing has been made that such mistake occurred in good faith, the Director may, upon payment of the required fee, issue a certificate of correction, if the correction does not involve such changes in the patent as would constitute new matter or would require re-examination.

35 U.S.C. § 255 (emphasis added).

The Federal Circuit has stated that, in order to invalidate a certificate of

---

[15] Whenever a mistake in a patent, incurred through the fault of the Patent and Trademark Office, is **clearly disclosed** by the records of the Office, the Director may issue a certificate of correction stating the fact and nature of such mistake, under seal, without charge, to be recorded in the records of patents.

35 U.S.C. § 254 (emphasis added).

correction for impermissible broadening, proof of two elements must be present: "(1) the corrected claims are broader than the original claims; and (2) the presence of the clerical or typographical error, or how to correct that error, is **not** clearly evident to one of skill in the art." *See Central Admixture Pharm. Svcs., Inc. v. Adv. Cardiac Solutions, P.C.*, 482 F.3d 1347, 1353-54 (Fed. Cir. 2007) (emphasis added). The first element, a claim construction issue, is a question of law. *Id.* (citations omitted). "The second element, whether the error and its correction would both be clearly evident to one of skill in the art, has been treated as a factual question." *Id.* (collecting authority).

The Federal Circuit has further enumerated three categories into which an error may fall: (1) "mistakes [that] are immediately apparent and leave no doubt as to what the mistake is," such as a blatant misspelling; (2) "those typographical mistakes not apparent to the reader at all; for example, a mistake resulting in another word that is spelled correctly and that reads logically in the context of the sentence;" and (3) "where it is apparent that a mistake has been made, but it is unclear what the mistake is." *Superior Fireplace Co. v. Majestic Prods. Co.*, 270 F.3d 1358, 1370 (Fed. Cir. 2001). Section 255 does not preclude broadening corrections so long as they are corrections of clerical or typographical mistakes and "only where it is clearly evident from the specification, drawings, and prosecution history how the error should appropriately be corrected." *Id.* at 1372. Put another way, the public must be provided with notice as to the scope of the claims. *Id.*

(2) Discussion

The certificate of correction broadened the as-printed claims. There can be no

doubt that “ions” is broader than “hydrogen ions;” the corrected claim, as a matter of law, “covers territory the old [claim] did not.” *Central Admixture Pharm. Svcs.,* 482 F.3d at 1353. The certificate of correction is valid, therefore, only if it effectuated the “clearly evident” solution, as perceived by a person of ordinary skill in the art, to a clerical or typographical mistake. *Superior Fireplace*, 270 F.3d at 1373.

The threshold inquiry, however, is whether the misprinting of claims was a clerical or typographical mistake capable of correction under § 255 in the first instance. Neither party claims that a simple printing error occurred. Soitec argues that Examiner Fourson intentionally issued the same overly broad claims in the ‘396 patent that he had previously rejected in the parent case; MEMC claims that Examiner Fourson actually “examined a different set of claims than the applicant actually wanted,” which miscommunication was caused by the applicant’s June 3, 2004 fax. (D.I. 244 at 14)

The court notes at this juncture that both parties’ positions are predicated on unverifiable facts. Examiner Fourson cannot testify as to his intentions. Ultimately, the fact-finder has no tools to determine the precise error that occurred. Yet the court must ultimately resolve the issue of whether a “clear” solution to this cause-less problem exists in this case. MEMC’s proffered patent law expert can offer nothing but speculation as to what actually occurred during the prosecution of the ‘516 and ‘601 applications or as to Examiner Fourson’s state of mind.[16] There is nothing to suggest

---

[16]The court denies MEMC’s motion to admit the expert testimony of John Gooklasian (“Goolkasian”) regarding: (1) “the context of when and under what circumstances an applicant may make amendments after receiving an notice of allowance;” (2) “procedurally how these amendments are evaluated by the [PTO];” and (3) “how the applicants here avoided substantive examination of the broad claim scope covering all ‘ions’ by misusing these two types of post allowance/post-issuance

that the mistake that occurred was of a "minor character," as both parties recognize that the scope of the pending (and issuing) claims was changed; the argument is over whether this was intended to be the case.[17] Section 255, therefore, is inapplicable, and the certificate of correction for the '396 patent is invalid.

Even if the correction was of a mistake of minor character, the court need not determine the sufficiency of MEMC's evidence on the second, factual component of the test. If the certificate of correction for the '396 patent is valid, the patent claims are invalid as non-enabled pursuant to the Federal Circuit's prior *SiGen* decision, 81 Fed. Appx. at 738-39. If the certificate of correction for the '396 patent is invalid, the '396 patent claims would be invalid as anticipated by the '009 patent claims. The court need not expend further its limited resources on the issue, nor is a jury required to determine the propriety of the correction made.[18]

---

amendment procedures." (D.I. 142 at 10) The court does not allow patent law experts to testify; this case presents no grounds for exception to the court's practice in this regard. As described by MEMC, Goolkasian offers only general guidance about PTO practice. He has no specific knowledge regarding the '516 or '601 applications or either the PTO's or Examiner Fourson's treatment of the same.

[17]The applicants themselves recognized that the correction was "required to correct **significant** printing errors" in the '396 patent. (JA-0519-20) (emphasis added) The error could have been deemed a simple printing mixup if not for Examiner Fourson's comments in allowing the '601 application.

[18]The Federal Circuit has stated that, for a certificate of correction correcting an error of a minor character to be valid, it must effectuate a correction that is "clearly evident [to a person of ordinary skill in the art] from the specification, drawings, and prosecution history." *Superior Fireplace*, 270 F.3d at 1373. The court notes that it is unclear whether the "prosecution history" for purposes of § 255 includes, in these circumstances, the file wrapper of the parent application (issuing as the '009 patent) from which the '396 patent, filed as a continuation application, claimed priority. Certainly both file wrappers provide necessary context for the issue at bar.

That Soitec elected to bring suit on the ‘396 patent, with the state of its record in disarray and validity highly questionable, is remarkable,[19] bordering on frivolous. Its motion is denied; the ‘396 patent is invalid.

b. The ‘234 patent: indefiniteness

MEMC moves for summary judgment that claim 24 of the ‘234 patent is invalid for indefiniteness. (D.I. 187) There is no cross-motion by Soitec.

(1) Standard

The definiteness requirement is rooted in § 112, ¶ 2, which provides that “the specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.” “A determination of claim indefiniteness is a legal conclusion that is drawn from the court’s performance of its duty as the construer of patent claims.” *Personalized Media Comm., LLC v. Int’l Trade Com’n*, 161 F.3d 696, 705 (Fed. Cir. 1998).

> Determining whether a claim is definite requires an analysis of whether one skilled in the art would understand the bounds of the claim when read in light of the specification . . . If the claims read in light of the specification reasonably apprise those skilled in the art of the scope of the invention, § 112 demands no more.

Id. (citing *Miles Lab., Inc. v. Shandon, Inc.*, 997 F.2d 870, 875 (Fed. Cir. 1993)).

(2) Discussion

Claim 24 of the ‘234 patent depends from claim 21, which recites in relevant part: “conducting a subsequent thermal annealing of the semiconductor material substrate at **sufficiently** low temperature to **substantially** limit diffusion of **gas** from the

[19]Certainly, patentees have initiated reexaminations (prior to bringing suit) to shore up cleaner prosecution records than that presented here.

semiconductor material substrate." No mention of a specific time, temperature, or gas is made in the claim.

The court's task in determining whether the foregoing functional limitation is sufficiently definite "is a difficult one that is highly dependent on context." *Halliburton Energy Servs., Inc. v. M-I LLC*, 514 F.3d 1244, 1255 (Fed. Cir. 2008). The context here is, as Examiner Fourson noted, a highly unpredictable chemical art. (JA-1845) The Aspar patents themselves claim as their inventive features small process modifications (such as an intermediate heating) that result in tremendous differences. The court concludes that the applicants did not use "reasonably precise" terms to describe the invention of claim 24 in light of the subject matter. *See Exxon Research and Engineering Co. v. U.S.*, 265 F.3d 1371, 1379 (Fed. Cir. 2001) (citing *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1576 (Fed. Cir. 1986)).

The parties provide little extrinsic evidence to assist in the court's construction. *See id.* at 1376. Soitec relies on test results obtained from its litigation expert who completed a post-anneal analysis of the amount of hydrogen present in MEMC's wafers. (D.I. 247 at 15-16) Even assuming that these post-anneal tests (1) are accurate and (2) did not destroy the substrate (as MEMC suggests), this technique does not appear in the Aspar patents, and cannot be used to satisfy § 112. Soitec has not pointed to, and the court has not discerned, any portion of the Aspar patents' specification describing measuring the amount of hydrogen diffusing prior to, or during, the thermal annealing.

Soitec does not explain what a "sufficiently low temperature" is for purposes of

the claims. Focusing on the "substantially limit the diffusion of gas" term, Soitec states that "substantially" is defined by the maximum temperature noted for **all** of the "various phases of the method," or 900° C. (*See* '009 patent, col. 5:46) Soitec also states that one skilled in the art would understand, based on the specification, that diffusion must be limited such that the amount of implant material retained in the wafer would be sufficient to permit "embrittlement" to take place during the thermal treatment. (D.I. 247 at 17) Soitec does not point to any extrinsic evidence in this regard. MEMC points to deposition testimony by Bruel, stating that he did not know the difference between the temperature at which helium and hydrogen would diffuse within the silicon lattice. (MA-0875-76 at 208-09) ("I even don't know if all the mechanism[s] are well known. Because diffusion is also something which is not as simple we should like it is [sic].")

As an initial matter, the "900° C" maximum temperature of the process of the invention says nothing about the "sufficiently **low** temperature" limitation at issue – no lower boundary is provided. The specification provides only that the wafer embrittles, but separation does not occur, at the appropriate temperature and diffusion rate. ('234 patent, col. 3:35-38) Notwithstanding that the claim is not specific as to what "gas" diffuses from the wafer, there is no disclosure how diffusion of free gas from the wafer is to be measured, before or after the annealing. As Bruel's testimony indicates, diffusion is not a phenonemon that occurs uniformly with respect to all gases. There is no indication of how much diffusion is too much. The specification provides that diffusion should be limited so that bridge fracture does not occur, but essentially "teaches those skilled in the art [ ] to experiment and find out for themselves" the proper

balance of temperature and diffusion for the exuded gas. *See Exxon Research and Enginnering Co.*, 265 F.3d at 1379 (quoting *In re Jolly*, 172 F.2d 566, 569 (C.C.P.A. 1949)). The court has no compelling extrinsic evidence before it indicating otherwise. For these reasons, the court finds that claim 24 of the ‘234 patent is not amenable to construction and is, therefore, indefinite as a matter of law.[20] MEMC's motion is granted in this regard. (D.I. 187)

c. The ‘009 patent: claim construction in view of Bruel

(1) “Bridges”

MEMC argues that Soitec's proposed claim constructions eliminate the patentable distinctions of the Aspar patents over the ‘564 patent.[21] The first limitation at issue in this regard is “bridges,” which MEMC asserts must be construed to mean “bridges that are stable enough to avoid blistering of the implanted surface in the absence of a stiffener when exposed to the 400-700° C thermal treatments of electronic circuit production.” (D.I. 189 at 9) (citation omitted) Specifically, the parties'

---

[20] *Compare Exxon Research and Engineering Co.*, 265 F.3d at 1377 (term “to increase substantially” not invalid where the specification defined “substantially increased” catalyst activity as an increase of at least 30%, more preferably about 50%, and still more preferably an increase of about 75%); *see also id.* at 1378 (term “for a period sufficient” not indefinite where the specification stated that the period must be sufficient to increase catalyst productivity preferably at least about 30% and that this is “usually accomplished in about 0.25-24 hours, preferably about 0.5 to 2 hours”).

[21] The ‘564 patent issued on December 20, 1994, more than one year before the earliest priority date for the Aspar patents (May 15, 1996). The parties do not dispute that the ‘564 patent is prior art to the Aspar patents under 35 U.S.C. § 102(b).

The court notes that while MEMC's papers make clear that it asserts the ‘564 patent as invalidating prior art, Soitec's motion for summary judgment of validity is made with respect to the Bruel (reissue) patent. Because the ‘564 patent and Bruel patent have the same specification, the court's analysis is the same; it will refer to the ‘564 patent disclosure throughout its discussion.

proposals on this term are as follows:

Claim Term	MEMC's Proposed Claim Construction	Soitec/CEA's Proposed Claim Construction
"bridges" – '009 Patent, Claim 1, '396 Patent, Claim 1, and '234 Patent, Claim 21	Regions of substrate residing between microcavities that are sufficiently mechanically resistant to support all of the thermal treatment steps necessary to produce electronic circuits, yet sufficiently brittle so as to fracture when a mechanical force is applied. Therefore, before any bonding step, the implanted substrate does not blister when exposed to temperatures between 400-700°C, including a 500°C heat treatment for 30 minutes.	regions of substrate residing between microcavities

It is MEMC's position that, if Soitec's broad claim constructions are adopted, such as that proposed for "bridges," the distinctions between the '564 and Aspar patents will be nullified.

At this juncture, the court notes that the Aspar patents utilize broad and conditional language throughout the specification. For example: a thin layer "can possibly be provided with" electronic components ('009 patent, col. 1:11); electronic circuits "can be completely or in part created in these layers" (*id.*, col. 1:17); the inventions "allows" one to carry out a thermal treatment step without degrading surface condition (*id.*, col. 2:36); and the intermediate thermal treatment "can form" part of the operations for developing electronic components (*id.* at col. 2:41). Yet the crux of the invention is to provide, by a thermal treatment step, microcavities and bridges. These microcavities and bridges are described as being in a "stable state," such that electronic components can be produced in the wafer before the formation of the thin layer. (*Id.*, col. 3:21-26; col. 3:41-45) This stability also necessitates "an extra step of applying mechanical forces" to separate the layers. (*Id.*, col. 3:34-35)

During prosecution of the '009 patent, the examiner rejected the claims on the

ground that the specification does not "reasonably provide enablement for recitation of [the] formation of microcavities broadly." (JA-0085) In response, the applicants noted that they "are not claiming the formation of **any** microcavities, but only those that reside between solid bridges. As taught in the specification, it is these microcavities and solid bridges that facilitate handling and further processing of the wafer [ ] prior to detachment of the thin layer by the application of mechanical forces." (JA-0094-95) (emphasis added) Further, there is "ample guidance in the prior art for the formation of microcavities or bubbles in a substrate through the introduction of ions." (JA-0095) The examiner disagreed, insofar as the specification teaches that other methods result in undesirable surface blistering. (JA-0151) In response, the applicants amended the claims from "introducing ions" to "introducing hydrogen ions" to form the microcavities, and further limited the claims to require that the "hydrogen ions are introduced into the first substrate at a temperature and at a total amount so as to not fracture the solid bridges during energizing of the first substrate." (JA-0155)

The foregoing is insufficient to limit the claims to bridges that are able to withstand 400-700° C thermal treatments as MEMC suggests. The claims are cast broadly. MEMC does not cite, and the court has not located, a clear and unmistakable disclaimer of claim scope made during prosecution of the Aspar patents. *See Cordis Corp.*, 561 F.3d at 1329. The claims require only that the bridges be "solid."

Soitec does not specifically argue that the '564 patent does not disclose solid bridges. Rather,

> even if Soitec's claim construction of "bridges" is adopted, and even if the Bruel patent discloses a process in which "bridges" of material remain between the thin film and the rest of the substrate up to the point where the wafer is split, and

even if that disclosure anticipates the “bridges” **limitation** of the asserted Aspar patent claims, that does not mean that Bruel anticipates the asserted **claims**. MEMC’s problem remains that the Bruel specification does not teach the claimed used of “mechanical force” [ ] to split the wafers.

(D.I. 247 at 9-10) (emphasis in original) The court turns now to that assertion.

(2) “Mechanical forces”

The parties propose the following competing instructions for the “mechanical forces” limitation of the ‘009 patent claims:

Term	Asserted Claims	MEMC Proposed Construction	Soitec/CEA Proposed Construction
“applying mechanical forces to fracture the solid bridges”	All Aspar claims	Applying mechanical force to split the thin film layer and the rest of the substrate into two separate pieces.	Applying external mechanical force to split the thin film layer and the rest of the substrate into two separate pieces.

MEMC seeks the broader construction here, as it seeks to encompass within the claims the “internal mechanical forces” occurring during the heat treatment step (i.e., thermal cleaving). (D.I. 167 at 35)

“Separation” was addressed at length in the context of the *SiGen* litigation. As noted previously, claim 1 of the ‘564 patent described a process having three stages for the preparation of thin semiconductor films. In the third, thermal treatment stage, “a separation between the thin film and the majority of the substrate” was effected. In the *SiGen* litigation, the Federal Circuit found that “separation” is not limited to a complete separation or perfect cleavage between the layers. Specifically:

> The specification of the ‘564 patent describes “a separation” created during the thermal treatment “by a crystalline rearrangement effect in the wafer and a pressure effect in the microbubbles.” The separation results from the thermally induced “crystalline rearrangement” and “coalescence of the bubbles.” The specification does not require the “coalescence of the bubbles” to form a perfect cleavage between the top of the film and the bottom substrate. “Splitting or cleaving” the whole layer uniformly is a limitation not found in the ‘564 patent.

SiGen, 81 Fed. Appx. at 736-37.

On reexamination, the examiner addressed a protestor's argument that "cleaving" was not sufficiently described for §112 purposes because "[n]owhere does the specification of the '564 patent describe any cleaving technique other than thermal cleaving." (MA-0518) The protestor sought limitation of the claims to thermal cleaving techniques. The examiner found the argument unpersuasive in the absence of any teaching of "thermal cleaving" in the '564 patent specification and in view of the teaching of cleaving in four locations in the specification, for example, figure 4.

The examiner found "cleaving" to be enabled in view of evidence showing "that cleaving was considered to be a conventional technique to one of ordinary skill in the semiconductor manufacturing art at the time of the '564 patent, (see U.S. [Patent No.] 5,036,023 – col. 3, lines: 45-52) which states, 'the inventive method also comprises a variety of conventional steps, exemplarily including . . . dicing or cleaving of a semiconductor wafer . . . Such processing steps are **conventional and require no detailed discussion**.'" (MA-0521) (emphasis in original)

It is presumably because the examiner dismissed the argument that the claims of Bruel were limited to "thermal cleaving" that MEMC seeks a construction of the Aspar patent claims encompassing both thermal and mechanical cleaving. The Aspar patents' specification provides, however, that "the separation requires an extra step of applying mechanical forces" to achieve a separation during the thermal treatment. ('009 patent, col. 3:34-35) Although the court discerns no occasion to add Soitec's proposed "external" forces limitation, MEMC cannot read out the separate separation step. Put another way, the forces internal to the wafer during the thermal treatment

step cannot also constitute the “mechanical forces” of the subsequent separation step.

d. The ‘009 patent: anticipation by Bruel

(1) Standard

An anticipation inquiry involves two steps. First, the court must construe the claims of the patent in suit as a matter of law. *See Key Phar. v. Hercon Labs. Corp.*, 161 F.3d 709, 714 (Fed. Cir. 1998). Second, the finder of fact must compare the construed claims against the prior art. *See id.* A finding of anticipation will invalidate the patent. *See Applied Med. Resources Corp. v. U.S. Surgical Corp.*, 147 F.3d 1374, 1378 (Fed. Cir. 1998). Issued patents are presumed valid, and the “underlying determination of invalidity . . . must be predicated on facts established by clear and convincing evidence.” *Rockwell Int’l Corp. v. United States*, 147 F.3d 1358, 1362 (Fed. Cir. 1998) (citations omitted).

A prior art reference may anticipate without explicitly disclosing a feature of the claimed invention if that missing characteristic is inherently present in the single anticipating reference. *See Continental Can Co. USA v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991). The Federal Circuit has explained that an inherent limitation is one that is “necessarily present” and not one that may be established by “probabilities or possibilities.” *See id.* at 1268-69. That is, “[t]he mere fact that a certain thing may result from a given set of circumstances is not sufficient.” *Id.* at 1269 (emphasis in original) (citations omitted).

(2) Discussion

Figure 4 of the ‘564 patent, upon which the examiner relied during reexamination

to support enablement, does not specifically disclose “mechanical cleaving” – only an already-cleaved wafer substrate and film layer (attached to the stiffner layer). There is no specific mention of “mechanical cleaving” in connection with figure 4. It is MEMC’s argument, therefore, that the separate mechanical cleaving step – the distinguishing feature of the Aspar patents – is inherently taught by the ‘564 patent. (‘009 patent, col. 3:28-35)

As noted above, the examiner found “cleaving” to be enabled. The fact that mechanical cleaving may have been “**conventional**,” such as not to require specific description, is a different inquiry than whether it was **inherent to** the ‘564 patent. *See In re Omeprazole Patent Litigation,* 483 F.3d 1364, 1373 (Fed. Cir. 2007) (“[I]nherency is not necessarily coterminous with knowledge of those of ordinary skill in the art. Artisans of ordinary skill may not recognize the inherent characteristics or functioning of the prior art.”) (citations omitted).

Inherency is a factual issue. *See Continental Can*, 948 F.2d at 1268-69. The issue at bar is whether there exists a triable issue of fact with respect to whether a person of ordinary skill in the art would recognize that the ‘564 patent **necessarily** includes mechanical cleaving. The *SiGen* Court did not issue a finding in this regard – only that complete cleavage need not result from the thermal treatment step of the ‘564 patent.

In support of its motion, MEMC has provided claim charts comparing each limitation of the asserted Aspar patent claims to the disclosure of the ‘564 patent. What is conspicuously absent from the summary judgment record, however, is supporting

expert testimony. Neither MEMC's papers nor its claim charts reflect an expert's opinion that the '564 patent inherently taught "applying mechanical forces to fracture the solid bridges" as required by the asserted claims.[22] (D.I. 189 at 8-10 (citing MA0828-831.1; MA0835-38; MA0840-44); D.I. 242 at 8-11) MEMC asserts only that Dr. Poumeyrol, named inventor on the Aspar patents, testified that the Bruel process did not always result in complete cleavage during the thermal treatment step. (D.I. 242 at 10) Absent any indication that MEMC has evidence that mechanical cleaving was "necessarily" taught by the '564 patent, judgment of no anticipation must be entered in Soitec's favor.

e. The '009 patent: obviousness in light of Bruel

(1) Standard

"A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art." 35 U.S.C. § 103(a). Obviousness is a question of law, which depends on several underlying factual inquiries.

> Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be

---

[22]Certainly, the technology at bar is sufficiently complex so as to warrant expert testimony on anticipation and obviousness. *See, e.g., Wyers v. Master Lock Co.*, — F.3d — , No. 2009-1412, 2010 WL 2901839 at *15, n.5 (Fed. Cir. Jul. 22, 2010) (citations omitted).

patented.

KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 406 (2007) (quoting *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966)).

"[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR*, 550 U.S. at 418. Likewise, a defendant asserting obviousness in view of a combination of references has the burden to show that a person of ordinary skill in the relevant field had a reason to combine the elements in the manner claimed. *Id*. at 418-19. The Supreme Court has emphasized the need for courts to value "common sense" over "rigid preventative rules" in determining whether a motivation to combine existed. *Id*. at 419-20. "[A]ny need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed." *Id*. at 420. In addition to showing that a person of ordinary skill in the art would have had reason to attempt to make the composition or device, or carry out the claimed process, a defendant must also demonstrate that "such a person would have had a reasonable expectation of success in doing so." *PharmaStem Therapeutics, Inc. v. ViaCell, Inc*., 491 F.3d 1342, 1360 (Fed. Cir. 2007).

"Because patents are presumed to be valid, *see* 35 U.S.C. § 282, an alleged infringer seeking to invalidate a patent on obviousness grounds must establish its obviousness by facts supported by clear and convincing evidence." *Kao Corp. v. Unilever U.S., Inc.*, 441 F.3d 963, 968 (Fed. Cir. 2006) (citation omitted). In conjunction with this burden, the Federal Circuit has explained that,

> [w]hen no prior art other than that which was considered by the PTO examiner is relied on by the attacker, he has the added burden of overcoming the deference that is due to a qualified government agency presumed to have properly done its job, which includes one or more examiners who are assumed to have some expertise in interpreting the references and to be familiar from their work with the level of skill in the art and whose duty it is to issue only valid patents.

PowerOasis, Inc. v. T-Mobile USA, Inc., 522 F.3d 1299, 1304 (Fed. Cir. 2008) (quoting *Am. Hoist & Derrick Co. v. Sowa & Sons*, 725 F.2d 1350, 1359 (Fed. Cir. 1984)).

(2) Discussion

The foregoing discussion on anticipation informs the court's discussion on obviousness, which is also a subject of MEMC's motion for summary judgment of invalidity. (D.I. 187) MEMC cites no expert testimony in support of its obviousness argument. (D.I. 189 at 10-12) Rather, MEMC's evidence consists of the following: (1) Poumeyrol testified that he used tweezers to pry layers apart (MA-0865); (2) Bruel testified that "everybody in the [ ] field of electronics knows that . . . you can insert any mechanical tool between the two wafers. That's a straightforward, evident way of exerting . . . a force between the — in the structure" (MA-0873-74); and (3) Aspar testified regarding measuring the debonding time between two wafers by inserting a blade between the wafers and generally confirmed that this technique could be used in the context of the Aspar patents (MA-882-84). MEMC further provides additional prior art that it asserts illustrates the shearing and tensile forces that can be used to separate the thin film from the substrate, but describes no expert opinion confirming its interpretation of the references. (D.I. 189 at 10-11)[23] In response, Soitec points to

[23]MEMC references claim charts at "MA-0546-0858" in support. This citation appears to be in error.

testimony by Poumeyrol that the “mechanical cleave happened by surprise” when he attached a plastic foil to the implanted wafer surface and was able thereafter to remove the foil like an image transfer.[24] (PA-263 at 68)

The fact that several persons of skill in the art (here, inventors) were familiar with mechanical cleaving is not dispositive of whether it would have been obvious for a person of ordinary skill in the art to perform the Aspar method using either the ‘564 patent alone or in combination with any of MEMC’s additional prior art references. MEMC has provided evidence of obviousness, however, this evidence does not rise to the level of “clear and convincing” such as is required to invalidate the ‘009 patent on summary judgment. MEMC’s motion is denied on this ground.[25]

f. The ‘009 patent: anticipation by the ‘252 patent

MEMC argues that the ‘252 (Aspar) patent – to which the ‘009 patent claims priority in the chain – anticipates the ‘009 and ‘396 patents because those patents are not entitled to the ‘252 patent’s priority date. MEMC argues that, because the **as-filed** claims of those applications were broader than (and not enabled by) the specification common to the ‘252, ‘009 and ‘396 patents, then the earliest possible priority date to which the ‘009 and ‘396 patents may claim priority is February 6, 2001.

In support of its motion, MEMC relies on *Anascape, Ltd. v. Nintendo of America*,

---

[24]Soitec also references technical expert testimony, but its citation (“D.I. 193 at ¶¶ 28-29”) appears to be in error.

[25]It is unclear on the record at bar whether MEMC has the required expert testimony to present its obviousness case at trial. The court will address any disputes in this regard at the pretrial conference. The court will not entertain additional motions in limine in this regard.

Inc., 601 F.3d 1333 (Fed. Cir. 2010). (D.I. 189 at 15-16) In *Anascape*, the question was whether the **claims** of the **issued** patent (the '700 patent), filed as a continuation-in-part application, were supported by the specification of the parent (the '525 patent) "in sufficient detail that one skilled in the art [could] clearly conclude that the inventor invented the claimed invention as of the filing date sought." *Id.* at 1334-35. MEMC provides no authority for the proposition that the scope of the **as-filed** claims are relevant to any validity analysis. Because the specifications of the patents are the same, the issue raised by MEMC is one of enablement/or and written description, not anticipation. MEMC's motion is denied on this ground.

g. The '009 patent: written description

Soitec moves for partial summary judgment that the Aspar patents satisfy the written description requirement. (D.I. 202) The written description requirement of 35 U.S.C. § 112, ¶1[26] ensures that "the patentee had possession of the claimed invention at the time of the application, i.e., that the patentee invented what is claimed." *LizardTech, Inc. v. Earth Resource Mapping, Inc.*, 424 F.3d 1336, 1344-45 (Fed. Cir. 2005). "[T]he description must clearly allow persons of ordinary skill in the art to recognize that the inventor invented what is claimed." *Ariad*, 598 F.3d at 1351 (citations and internal brackets omitted). "In other words, the test for sufficiency is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Id.*

[26]"The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same[.]"

(citations omitted). Whether the written description requirement is met is a question of fact. *Martek Biosciences Corp. v. Nutrinova, Inc.*, Nos. 2008-1459 & 2008-1476, 2009 WL 2780367 at *3 (Fed. Cir. Sept. 3, 2009) (citation omitted).

MEMC's argument that the '009 patent does not meet the written description requirement of § 112 is that the terms "introducing" and "first substrate" are overbroad and not supported by the specification. (D.I. 243 at 16) MEMC does not cite any evidence in support of this position. (*Id.* at 16-17) MEMC's argument in this regard is essentially one of claim construction, not invalidity. In this regard, the parties have proffered agreed-upon constructions for both the "introducing" and "first substrate" claim terms. (D.I. 155)

MEMC also argues that, if the claims are not limited to bridges that are able to withstand 400-700° C thermal treatments, the claims lack written description support for processes yielding implanted substrates that would blister at these temperatures. (*Id.* at 19) MEMC's expert, Dr. Robert Averback, states that a person of ordinary skill in the art would understand from the specification that the inventors were not in possession of a process in which the implantation conditions resulted in blistering. (MA-1418-19 at ¶ 121) This argument – that the inventors were not in possession of the prior art – is perplexing. The inventors claimed an improvement over this very art. MEMC cannot simultaneously argue that the Aspar patent inventors claimed the prior art (as per its invalidity motion) yet were not in possession of it. Notwithstanding, the written description inquiry is how a person of ordinary skill in the art, who is presumed to be familiar with the prior art, reads the disclosure of the specification. MEMC has not demonstrated that it can adduce evidence at trial that could be viewed by a reasonable

jury as clear and convincing evidence of invalidity on this ground. Soitec's motion is granted.

h. The '009 patent: best mode

Soitec also moves for partial summary judgment that the best mode requirement of § 112 is satisfied with respect to the Aspar patents. (D.I. 213) Whether the patent satisfies the best mode requirement is a question of fact, but the appropriate legal standard to apply to the analysis of the facts is a question of law, subject to *de novo* review by the Federal Circuit. *See Bayer AG v. Schein Pharms., Inc.*, 301 F.3d 1306, 1312 (Fed. Cir. 2002). Violation of the best mode requirement of 35 U.S.C. § 112, 1 ¶, is evidenced by: (1) the inventor subjectively knowing of a better mode of practicing the invention at the time of filing the patent application; and (2) the inventor concealing that better mode during the prosecution of the application. *See High Concrete Structures, Inc. V. New Enterprise Stone and Lime Co.*, 377 F.3d 1379, 1382 (Fed. Cir. 2004). In those occasions when the Federal Circuit holds a patent invalid for violation of the best mode requirement, the patent either (1) failed to disclose the inventor's preferred embodiment or (2) failed to disclose the inventor's preference in the use or fabrication of the invention that materially affected the properties of the claimed invention. *See Bayer*, 301 F.3d at 1316.

According to MEMC, the inventors of the Aspar patents violated the best mode requirement by failing to disclose any details regarding their preferred pre-bond cleaning techniques for practicing the claimed "bonding" step of the patents. (D.I. 262) The threshold issue in this regard is the appropriate scope of the term "bonding" as

used in the ‘009 patent, or “bonding a second substrate to the face surface of the first substrate.”

According to Soitec, “bonding” is simply “causing two surfaces to adhere.” MEMC asserts, by contrast, that “bonding” is “any sticking operation or operation of preparing the surfaces and bringing them into contact that provides for sufficient bonding energy between the two substrates so that applying a mechanical force will split the thin layer from the rest of the first substrate rather than de-bond the substrate.”

In its opposition papers, MEMC provides evidence that the inventors preferred a hydrophilic bonding technique, for example: (1) a 1992 memo by Bruel stating that wafer surface condition must be improved to achieve strong bond energy and suggesting studying of optimal wafer cleaning (MA-1958); (2) 1996 conference literature by Bruel, Aspar, Poumeyrol and others entitled “Cleaning and Polishing as Key Steps for Smart-Cut® SOI Process” stating that pre-bond wafer cleaning is very important to achieving desirable properties (MA-1954-55); and (3) Bruel’s testimony that wafer cleaning was necessary to achieving good quality layers (MA-2016 at 114).

MEMC’s best mode theory comprises two logical steps: (1) the inventors possessed a preferred hydrophilic bonding technique; and (2) to achieve this technique, a pre-cleaning step was required. MEMC focuses on the inventors’ non-disclosure of the latter. The claims, however, do not contain a “cleaning” step and the court declines to interpret the “bonding” limitation so as to include pre-bond cleaning. MEMC points to the following portions of the specification in support of its claim construction:

> If needed, just before the separation step, an extra step is provided, consisting of bringing said wafer, on the side of said flat face, into close contact with and rigidly fixing it to a support through which mechanical forces such as tensile

> and/or shearing forces will be applied.

(‘009 patent, col. 3:49-53)

> By the term rigidly fixing the applicator onto the wafer, one understands here any sticking operation or operation of preparing the surfaces and bringing them into contact that allows sufficient bonding energy to be provided between the applicator and the flat face of the wafer to resist the tensile and/or shear and/or bending process(es) of the separation step.

(*Id.*, col. 6:11-17) (emphasis added) That “any sticking operation” suffices is sufficient support for Soitec’s proposed construction, “causing two surfaces to adhere.” MEMC’s construction is complex and unhelpful to the trier of fact. More fundamentally, the court can discern no justification for incorporating process parameters into the “bonding” limitation of the claim. The additional details provided by the specification (regarding bonding energy and so forth) are unclaimed subject matter. Preferred methods for achieving these process parameters need not be disclosed to satisfy the best mode requirement. *See Zygo Corp. v. Wyko Corp.*, 79 F.3d 1563, 1567-68 (Fed. Cir. 1996) (citation omitted). Soitec’s motion is granted.[27] (D.I. 213)

5. Inequitable conduct

The court next addresses Soitec’s motion for partial summary judgment that the Aspar patents are “not invalid” for inequitable conduct.[28] (D.I. 206) There is no cross motion by MEMC.

---

[27]The court denies as moot Soitec’s motion to exclude the expert report of Dr. Pascal Bellon and any related testimony (D.I. 186), which was proffered by MEMC on the issue of best mode.

[28]Soitec consistently refers to the concept of “invalidity” in its inequitable conduct papers. Invalidity and unenforceability are, of course, distinct concepts in patent law and the court cannot find any patent invalid for inequitable conduct.

a. Standard

Applicants for patents and their legal representatives have a duty of candor, good faith, and honesty in their dealings with the PTO. *Molins PLC v. Textron, Inc.*, 48 F.3d 1172, 1178 (Fed. Cir. 1995); 37 C.F.R. § 1.56(a). This duty is predicated on the fact that "a patent is an exception to the general rule against monopolies and to the right of access to a free and open market." *Precision Instrument Mfg. Co. v. Auto. Maint. Mach. Co.,* 324 U.S. 806, 816 (1945). The duty of candor, good faith, and honesty includes the duty to submit truthful information and the duty to disclose to the PTO information known to patent applicants or their attorneys which is material to the examination of a patent application. *Elk Corp. of Dallas v. GAF Bldg. Materials Corp.*, 168 F.3d 28, 30 (Fed. Cir. 1999). A breach of this duty constitutes inequitable conduct. *Molins*, 48 F.3d at 1178.

If it is established that a patent applicant engaged in inequitable conduct with respect to one claim, then the entire patent application is rendered unenforceable. *Kingsdown Med. Consultants v. Hollister Inc.*, 863 F.2d 867, 877 (Fed. Cir. 1988). Additionally, "[a] breach of the duty of candor early in the prosecution may render unenforceable all claims which eventually issue from the same or a related application." *Fox Indus., Inc. v. Structural Pres. Sys., Inc.*, 922 F.2d 801, 803-04 (Fed. Cir. 1990).

A finding of inequitable conduct is "an equitable determination" and, therefore, "is committed to the discretion of the trial court." *Monon Corp. v. Stoughton Trailers, Inc.*, 239 F.3d 1253, 1261 (Fed. Cir. 2001). In order to establish unenforceability based on inequitable conduct, a defendant must establish by clear and convincing evidence that:

(1) the omitted or false information was material to patentability of the invention; (2) the applicant had knowledge of the existence and materiality of the information; and (3) the applicant intended to deceive the PTO. *Molins*, 48 F.3d at 1178. A determination of inequitable conduct follows a two-step analysis. The withholding of information must first meet threshold findings of materiality and intent. *Id.*

Prior to 1992, two standards for materiality were in effect: (1) the materiality standard set forth in the present version of PTO Rule 56, 37 C.F.R. § 1.56(b); and (2) the previous version of that rule. *See Digital Control Inc. v. Charles Machine Works*, 437 F.3d 1309, 1314 (Fed. Cir. 2006). The Court in *Digital Control* held that the new 1992 iteration of Rule 56 was not intended to replace the broader old Rule 56, and "merely provides an additional test of materiality." *Id.* at 1316. Therefore, "if a misstatement or omission is material under the new Rule 56 standard, it is material. Similarly, if a misstatement or omission is material under the 'reasonable examiner' standard or under the older three tests, it is also material." *Impax Labs., Inc. v. Aventis Pharm. Inc.*, 468 F.3d 1366, 1374 (Fed. Cir. 2006) (quoting *Digital Control*, 437 F.3d at 1316)).

Rule 56 formerly provided that "information is material where there is a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent." 37 C.F.R. § 1.56 (1990). The inquiry presented under the prior "reasonable examiner" standard is whether "a reasonable examiner would have considered such [omitted] prior art important in deciding whether to allow the patent application." *Impax Labs.*, 468 F.3d at 1374

(quoting *Digital Control*, 437 F.3d at 1314)).

The applicable “older three tests” referenced in *Digital Control* include: (1) the objective “but-for” standard, in other words, “where the misrepresentation was so material that the patent should not have issued;” (2) the subjective “but-for” test, in other words, “where the misrepresentation actually caused the examiner to approve the patent application when he would not otherwise have done so;” and (3) the “but it may have” standard, “where the misrepresentation may have influenced the patent examiner in the course of prosecution.” *See Impax Labs.*, 468 F.3d at 1374, n.5 (quoting *Digital Control,* 437 F.3d at 1315)).

Currently, Rule 56 is narrower in scope:

> Information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and
>
> (1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or
>
> (2) It refutes, or is inconsistent with, a position the applicant takes in:
> (i) Opposing an argument of unpatentability relied on by the Office, or
> (ii) Asserting an argument of patentability.

37 C.F.R. § 1.56(b) (2007).[29]

After determining that the applicant withheld material information, the court must

---

[29]Further,

> [a] prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

37 C.F.R. § 1.56(b) (2007).

decide whether the applicant acted with the requisite level of intent to mislead the PTO. *See Baxter Int'l, Inc. v. McGaw Inc.*, 149 F.3d 1321, 1327 (Fed. Cir. 1998). "Intent to deceive cannot be inferred solely from the fact that information was not disclosed; there must be a factual basis for finding a deceptive intent." *Hebert v. Lisle Corp.,* 99 F.3d 1109, 1116 (Fed. Cir. 1996). That is, "the involved conduct, viewed in light of all the evidence, including evidence indicative of good faith, must indicate sufficient culpability to require a finding of intent to deceive." *Kingsdown*, 863 F.2d at 876. A "smoking gun" is not required in order to establish an intent to deceive. *See Merck*, 873 F.2d at 1422. An inference of intent, nevertheless, is warranted where a patent applicant knew or should have known that the withheld information would be material to the PTO's consideration of the patent application. *Critikon, Inc. v. Becton Dickinson Vascular Access, Inc.,* 120 F.3d 1253, 1256 (Fed. Cir. 1997).

Once materiality and intent to deceive have been established, the trial court must weigh them to determine whether the balance tips in favor of a conclusion of inequitable conduct. *N.V. Akzo v. E.I. DuPont de Nemours*, 810 F.2d 1148, 1153 (Fed. Cir. 1987). The showing of intent can be proportionally less when balanced against high materiality. *Id.* In contrast, the showing of intent must be proportionally greater when balanced against low materiality. *Id.* Because a patent is presumed valid under 35 U.S.C. § 282, inequitable conduct requires proof by clear and convincing evidence. *Manville Sales Corp. v. Paramount Sys., Inc.*, 917 F.2d 544, 551 (Fed. Cir. 1990).

b. Facts

The '009 patent was jointly prosecuted by patent attorneys J. William Dockrey

("Dockrey") and Norman P. Soloway ("Soloway").[30] The '234 patent was prosecuted by Dockrey without the assistance of Soloway. (MA-1070-1 at 156:18-157:10; MA-1061 at 101:17-102:16) Dockrey, a registered patent attorney since 1992, is a partner with Brinks Hofer Gilson & Lion. Soloway is a founding partner of Hayes Soloway, P.C. and has been working as a patent attorney for over forty consecutive years. (MA-1028-29 at 37:18-39:7; MA-1042-43 at 16:9-17:1) Both have extensive technical backgrounds and have prosecuted over 2500 patents combined. (MA 1024 at 16:5-17:23; MA-1043 at 20:6-8)

Dockrey monitored the *SiGen* litigation, discussed *supra*, on behalf of CEA and consulted with two of Soitec's trial attorneys via email. (MA-1029 at 39:21-40:10; MA-1083-102 at entry nos. 52, 225, 5871) Dockrey also helped draft pleadings and legal memoranda for the *SiGen* litigation. (MA-1029-31 at 41:25-47:8) Ultimately, the jury in *SiGen* found that the specification of the '564 patent did not enable, or teach, one skilled in the art to practice the first "implantation" step of the claimed process with anything other than hydrogen ions, and held the '564 patent invalid for lack of enablement. *SiGen*, 81 Fed. Appx. at 738-39. There is no dispute that Dockrey did not disclose any of the *SiGen* litigation documents to the PTO or notify the PTO of the jury verdict during the (copending) prosecution of the '009 patent.[31] (MA-1037-38 at 96:21-

---

[30] Dockrey and Soloway also jointly prosecuted the '252 and '192 patents, which are not asserted in this suit. There is a factual dispute regarding prosecution of the '396 patent – while Dockrey denies that he or his firm helped prosecute the patent, Soloway testified that Dockrey was responsible for prosecuting the '396 patent. (D.I. 253 at 8)

[31] MEMC alleges that Dockrey also failed to disclose the *SiGen* litigation during prosecution of the '252 and '192 patents, which are not asserted in this suit. (D.I. 253

99:9) However, after the ‘009 patent had issued, Dockrey did disclose the *SiGen* litigation and the reissue proceedings for the Bruel patent during prosecution of the ‘396 patent. (D.I. 253 at 8 n.4, 18)

The relevant dates are as follows. The ‘009 patent was filed on February 6, 2001. It is a self-described improvement over the invention of Bruel. The jury verdict in the *SiGen* litigation invalidating the ‘564 patent was returned on October 21, 2002. *See SiGen*, 81 Fed. Appx. at 735. While the verdict was on appeal to the Federal Circuit, reissue proceedings on the ‘564 patent were commenced on May 30, 2003. The Federal Circuit affirmed the jury verdict that the ‘564 patent was invalid on November 26, 2003. Following the Federal Circuit’s decision, the pending ‘009 patent claims were narrowed to “hydrogen ions” (from “ions”) on February 25, 2004. (JA-155-59) The ‘009 patent issued thereafter on October 26, 2004. On December 6, 2004, Dockrey disclosed the existence of the *SiGen* litigation within the context of the pending ‘396 patent application. The ‘484 (Bruel reissue) patent issued February 6, 2007.

Soloway testified that, on the Aspar patents he prosecuted with Dockrey, he acted as a “mailbox,” simply filing what he was given with the PTO. (MA-1047 at 34:22-36:23; MA-1047-48 at 36:6-37:19) Soloway was not involved in drafting any claim language, responding to any office actions, or gathering any references for disclosure to the PTO. (MA-1047 at 34:22-36:23) Soloway testified that he was aware that CEA was

---

at 9)

The court notes that Soitec states that CEA filed IDSs that disclosed prior art to the examiner that had been uncovered in the *SiGen* litigation and, in those IDSs, generally identified “litigation involving a related patent.” (D.I. 207 at 3-4) Soitec does not argue that such vague reference constitutes a disclosure.

involved in litigation, but did not ask Dockrey (or anyone at CEA) about it. (MA-1055 at 77:9-78:10) Entries on Soloway's privilege log contradict this testimony; the log indicates that Soloway conferred with members of Dockery's law firm regarding the *SiGen* litigation in 2000. (MA-1051-52 at 54:19-56:11; MA-1103 at entry 120)

c. Discussion

It is MEMC's theory that Dockrey used Soloway as a "straw man" to file prosecution papers (under Soloway's signature) in an effort to evade his duty of candor. (D.I. 253 at 1) Dockrey withheld the "identity, pendency and outcome of the *SiGen* litigation, and took positions contrary to the *SiGen* judgment before the [PTO] during prosecution of the Aspar patents." (*Id.* at 1) Specifically, MEMC asserts that Dockrey knowingly withheld from the PTO: (1) the fact that the subject matter of the applications (and validity of a related patent) was being litigated in *SiGen*; (2) litigation documents, for example, the *SiGen* court's *Markman* order;[32] (3) the *SiGen* jury's adverse verdict; and (4) the Federal Circuit's opinion affirming the jury's non-enablement determination. (*Id.* at 2, 7, 12)

As an initial matter, because Dockrey disclosed the foregoing to the PTO while the '396 patent and Bruel (reissue) patent were pending before it, MEMC has no claim for inequitable conduct with respect to these or the '234 patent. *See Upjohn Co. v. Mova Pharm. Corp.*, 225 F.3d 1306, 1312 (Fed. Cir. 2000) (citation omitted) (inequitable conduct requires that the patentee withheld material information from the examiner);

---

[32]There appears to be no copy of record. MEMC cites this order as MA1078-82, which corresponds to a printout of the District Court for the District of Massachusetts' docket.

see also MPEP § 609.02 (disclosures carry over to continuation applications). Remaining, therefore, is a determination of the enforceability of the ‘009 patent. On Soitec’s motion, the court must determine whether MEMC can adduce evidence at trial that may be deemed clear and convincing – whether it be a high level of materiality and lower level of intent, or vice versa.

Soitec does not contest that Dockrey was aware of (and involved to some degree in) the *SiGen* litigation while commensurately prosecuting the ‘009 patent application. It argues that the *SiGen* litigation was immaterial to the ‘009 patent prosecution once the pending claims were narrowed to “hydrogen ions.” (D.I. 282 at 3-4) Soitec also argues that the ‘009 patent was enabled as of May 15, 1996, the date of the French application to which the Aspar patents claim priority. (*Id.*) Soitec’s arguments are not convincing. The relevant inquiry is not whether the invalidation of the ‘564 patent would ultimately establish the unpatentability of the ‘009 patent claims, but whether a reasonable examiner would have deemed it relevant to his review, and/or whether it would affect the soundness or consistency of arguments made in favor of the patentability of the pending ‘009 patent claims.

The court finds that the examiner would have reasonably considered important the fact that the patent over which the ‘009 patent inventors claimed a patentable improvement was invalidated for lack of enablement. *See Impax*, 468 F.3d at 1374. This is especially the case considering the as-filed ‘009 patent claims mimicked the scope of the invalidated ‘564 patent claims: both broadly claimed “ions.” During prosecution of the ‘009 patent, CEA argued that numerous prior art references provided guidance for the formation of the claimed “microcavities” through the introduction of

"ions," and that this plethora of guidance indicated that a person of ordinary skill in the art could practice the invention without undue experimentation. (JA-95-97) Even putting aside the fact that the '009 patent claims an improvement over subject matter disclosed in the '564 patent, it is undisputable that both the '564 patent and '009 patent concern the same subject matter. *See* MPEP § 2001.06(c) ("Where the subject matter for which a patent is being sought is or has been involved in litigation, the existence of such litigation and any other material information arising therefrom must be brought to the attention of the [PTO.]").

The court also finds that MEMC has adduced facts from which an intent to deceive could be inferred. As stated previously, there is no dispute that Dockrey was simultaneously involved in both the *SiGen* litigation and the prosecution of the Aspar patents. Only after the Federal Circuit affirmed the jury verdict that the '564 patent was invalid were the pending '009 patent claims narrowed to "hydrogen ions." Dockrey alerted the PTO to the *SiGen* litigation (and Bruel reissue proceedings) less than two months after the '009 patent was issued.

Soitec has not provided an explanation for the withholdings; however, this fact is not dispositive. *See Larson Mfg. Co. of South Dakota, Inc. v. Aluminate Prods., Ltd.*, 559 F.3d 1317, 1341 (Fed. Cir. 2009) ("[A]n accused infringer cannot carry its threshold burden [of providing a factual basis for finding a deceptive intent] simply by pointing to the absence of a credible good faith explanation.") (citations omitted). Here, Dockrey had actual knowledge of the *SiGen* litigation as he was involved in both proceedings. The timing of events suggests that the course of action in the '009 patent prosecution

was guided by the unfolding of events in the *SiGen* litigation. The *SiGen* litigation and Bruel reissue proceedings were disclosed only after the ‘009 patent issued. The foregoing circumstances justify an inference of an intent to deceive at this stage. Soitec’s motion is denied.[33] (D.I. 206)

The court notes that its decision to deny Soitec’s motion is buttressed by the fact that the Federal Circuit has resolved to clarify the law relating to inequitable conduct in connection with its pending *en banc* review in *Therasense, Inc. v. Becton, Dickinson & Co.*, Civ. Nos. 2008-1511, -1512, -1513, -1514, -1595. *See* 374 Fed. Appx. 35 (Fed. Cir. 2010). Significantly, the Federal Circuit will revisit the entirety of the materiality-intent-balancing framework for inequitable conduct as well as the proper standard for materiality, the role of the PTO in such determinations, and under what circumstances an inference of intent is justified. *Id.* Because the court finds that MEMC has adduced evidence in opposition to Soitec’s motion that could be deemed clear and convincing with respect to materiality[34] and intent, the court denies Soitec’s motion. A bench trial on inequitable conduct will be conducted and the parties will produce their respective evidence. The court, however, will stay its final determination on inequitable conduct pending issuance of the *Therasense* decision and the clarification of the appropriate

---

[33]In view of the court’s holding, the court does not at this time address MEMC’s argument with respect to Soloway. The court notes, however, that Soloway’s self-proclaimed role as a “mailbox” or “mail stop” is inconsistent with the notion that he took care to exercise his duty of disclosure to the PTO.

[34]Under at least the “reasonable examiner” standard.

standard.[35]

6. Conclusion: the Aspar patents

To summarize: (1) MEMC's motion for summary judgment of noninfringement (D.I. 199) is granted with respect to the Aspar patents; (2) MEMC's motion for partial summary judgment of invalidity of the asserted Aspar patent claims (D.I. 187) is granted with respect to the '234 and '396 patents and denied as to the '009 patent; (3) Soitec's motion for partial summary judgment that the certificate of correction for the '396 patent is valid (D.I. 204) is denied; (4) Soitec's motion for partial summary judgment that the Bruel patent does not anticipate the Aspar patents (D.I. 208) is granted; (5) Soitec's motion for partial summary judgment that the Aspar patent satisfies the written description requirement (D.I. 202) is granted; (6) Soitec's motion for partial summary judgment that the best mode requirement is satisfied (D.I. 213) is granted; (7) Soitec's motion to exclude the testimony of Pascal Bellon (D.I. 186) is denied as moot; and (8) Soitec's motion for partial summary judgment that the Aspar patents are not invalid for inequitable conduct (D.I. 206) is denied. The court turns now to those motions concerning MEMC's '812 patent.

C. The '812 Patent

1. Disclosure

The '812 patent describes a method for stripping the outer edges of bond and etch back SOI ("BESOI") wafers. The background of the invention states that a BESOI

---

[35]The court's practice is to bifurcate the issue of inequitable conduct for a bench trial following a jury trial on other issues. The parties may stay post-trial briefing pending the issuance of the *Therasense* decision.

wafer may be prepared by "forming an etch stop layer of very heavily doped silicon on a silicon substrate, forming a device layer of silicon on the etch stop layer, forming an insulator layer on the device layer and bonding a handle wafer to the insulator layer." ('812 patent, col. 1:26-31) The silicon substrate may be removed by "etching or by a combination of mechanical grinding followed by etching . . . the exposed etch stop layer may thereafter be removed using a preferential etch solution[.]" (*Id.* at col. 1:31-40) The '812 patent states that, when BESOI wafers are bonded, the edges of the wafers fail to uniformly bond and "the device layer of BESOI wafers often have edge margins of approximately 2-10 mm which exhibit voids, bubbles and other delaminations [which] detract from the desirability of the BESOI wafers." (*Id*. at col. 1:41-46) It is the object of the '812 patent, therefore, to provide a method for removing these edge margins without damaging the device layer. The claims of the '812 patent are not drawn to the method, but to the edge-free wafers resultant from the described process.[36]

The '812 patent describes a BESOI wafer comprising a handle wafer, an oxide layer on the surface of this handle layer, a device layer bonded to the oxide layer, and a p+ [positive] etch stop layer on the device layer having an exposed upper face. (*Id.* at col. 1:56-61; fig. 1(a)) "The process comprises masking the exposed face of the p+ etch stop layer, removing the edge margins of [this] layer and device layer from [the] periphery of the BESOI wafer, and removing the p+ etch stop layer to expose the device layer." (*Id.* at col. 1:61-65) Specifically: (1) the upper face of the handle wafer

[36]The process is claimed in U.S. Patent No. 5,668,045 ("the '045 patent"). As discussed *infra*, the '812 patent was filed as a divisional of the application issuing as the '045 patent, which claims the process invention.

is ground and polished with a conventional grinder and polisher (*id.* at col. 3:15-21; fig. 1(b)); (2) the handle wafer is subjected to an etchant solution which completely etches it away to expose the p+ etch stop layer (*id.*; fig. 1(b)-(c)); (3) a protective masking (such as wax) is applied to the p+ etch stop layer (*id.* at col. 3:21-23; 3: 35-39; fig. 1(d)); (4) the periphery of the BESOI wafer is abraded by grinding or by a chemical/mechanical polishing process (*id.* at col. 3:33-35; fig. 1(e)); (5) the masking is removed (*id.* at col. 4:4-6); and (6) the p+ etch stop layer is exposed to an etchant that completely removes the etch stop layer and exposes the device layer (*id.*, col. 4:6-13; fig. 1(f)).

The foregoing process is to be used to obtain a BESOI wafer having a thickness of less than approximately 2 microns. (*Id.*, col. 5:4-6) The specification provides a "similar process" to the foregoing for providing a BESOI wafer having a thickness of between approximately 2 and 50 microns. (*Id.*, col. 5:6-9; fig. 4) No p+ etch stop layer between the device wafer and the device layer is provided. The process begins with "another type of device wafer" directly adjacent to the device wafer, and it is bonded to a handle wafer with an oxide film. (*Id.*, col. 4:37-44; fig. 4(a)) Like the first process, the device wafer is ground and polished. (*Id.*, fig. 4(b)) Rather than removing the device wafer with an etchant solution at this point (*see id.*, fig. 1(b)-(c)), a masking is applied, and the abrasion step occurs (*id.*, col. 4:50-58; fig. 4(c)-(d)). The masking is then stripped and the device wafer is then subjected to an etchant, removing the device wafer entirely. (*Id.*, col. 4:59-65; fig. 4(d)-(e))

The finished wafers according to both embodiments of the process are described in terms of components and thickness (*id.*, col. 5:1-10) and the claims are directed to

SOI wafers comprising

> a handle wafer, an oxide layer on at least one surface of the handle wafer, and a device layer. The device layer has an exposed surface, a bonded surface generally parallel to and opposite the exposed surface, and a mean thickness of between approximately 500 angstroms and approximately 50 microns with a thickness variance of less than approximately 10% of the mean thickness. The bonded surface is bonded generally in its entirety to the oxide layer. The device layer is radially contained within the periphery of the bonded surface.

(*Id.* at col. 2:1-10)

2. Prosecution history

The application to which the '812 patent claims priority, U.S. Patent Application No. 346,695 ("the '695 application"), was filed on November 30, 1994. The '695 application contained fourteen claims: claims 1-9 covered a process for stripping the outer edge of a "bonded BESOI wafer;" claims 10-14 covered "an SOI wafer" and contain many of the limitations of as-issued claims 1-3 and 7 of the '812 patent. On June 26, 1995, the examiner issued a first office action imposing a restriction requirement vis a vis the process and device claims, stating:

> Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product[s][;] or (2) that the product as claimed can be made by another and materially different process (M.P.E.P. § 806.05(f)). In the instant case unpatentability of the group I invention [to the semiconductor device] would not imply unpatentability of the group II invention [to the process], **since the device of the group I invention could be made by a process materially different than that of the group II invention.** For example, the group I device could be made by a process that does not require an etch stop layer.

(MA-2279-80) (emphasis added) Although the examiner viewed the claims more broadly than the disclosure, no rejection based on any prior art or 35 U.S.C. § 112 were commensurately made.

In response, the applicants elected claims 1-9 (the process claims), added new process claims 15 to 20, and requested reconsideration of the restriction requirement, insofar as "[t]he claims of Group I are directed to wafers which may be produced by the process of claims 1-9." (MA-2282-83) On October 25, 1995, the examiner issued a second detailed action in which all pending process claims in the '695 application were rejected on the merits. The examiner acknowledged the traversal of the restriction requirement and noted that it was "not found persuasive because the applicant has not provided a convincing argument that a materially different process, as recited in Paper No. 5, mailed on June 26, 1995, would not be suitable in producing the same product of the Group I invention." (MA-2286) Insofar as the "Patent Office is not in a position to demonstrate the effectiveness of the materially different processes," e.g., ones not requiring an etch stop layer, the restriction requirement was deemed proper and made final. (*Id.*) The examiner issued several § 112 rejections as to claim form and stated that each of the claims would be allowable if rewritten.[37] (MA-2291)

U.S. Patent Application No. 820,593 ("the '593 application"), from which the '812 patent ultimately issued, was filed as a divisional application on March 19, 1997 with a preliminary amendment. The applicant changed the title of the application from "SOI wafer and process for stripping outer edge thereof" to "Edge stripped BESOI wafer," as that title "reflect[ed] the subject matter being claimed." (JA-1192) The claims were also amended to include additional limitations. (JA-1190-92) On October 3, 1997, the

---

[37] It does not appear as though the complete '045 patent file wrapper is contained among the parties' exhibits and, consequently, the court does not address the prosecution of the '695 application further.

examiner issued a rejection of all claims as obvious in view of U.S. Patent No. 5,013,681 to Godbey et al. ("Godbey"), teaching an SOI wafer having each of the claimed components except a percentage of thickness variance, which the examiner considered to lack novelty. (JA-1197) ("[I]nvolved is nothing more than skill of mechanic and exercise of patient experimentation.") Claims including the "beveled edge" limitation were also rejected as obvious in view of Godbey in combination with U.S. Patent No. 5,294,821 to Iwamatsu ("Iwamatsu"), the latter providing a "beveled edge extending between the peripheries of the bonded and exposed surfaces and the periphery of the bonded surface of the device layer being radially contained within and radially spaced from the periphery of a wafer 1." (JA-1198) The examiner noted that Godbey and Iwamatsu fail to teach "a wafer having a recess including a wafer 1 having a recess including inner and outer peripheries and beveled edges of the oxide layer 12 and wafer 1." (JA-1198) This limitation is present in Japanese Patent No. 404,369,872 to Kaneko ("Kaneco"), which, combined with the disclosures of Godbey and Iwamatsu, formed the basis of a third obviousness rejection. (JA-1198)

The applicants filed an amendment on March 3, 1998 adding three claims and traversing the examiner's § 103 rejection on several grounds. For example, while Godbey discloses generally an SOI wafer, it fails to disclose that the device layer is radially contained within the periphery of the bonded surface or a percentage of mean thickness variation. Iwamatsu, a reference that does not itself describe a wafer-bonding process and does not attribute any specific benefits to beveled edges, likewise fails to disclose a percentage of mean thickness variation. Godbey does not disclose that the beveled edge extends from the periphery of the bonded surface of the device

layer to that of the bonded surface or that voids and other delaminations were problems in the art to be solved. Finally, Kaneko does not suggest a semiconductor wafer having an oxide layer between the device and handle layer. (JA-1206-08) In sum, applicants argued that "it is well known in the art to produce SOI wafers having a thin device layer capable of being further processed. However, bonded SOI wafers have encountered problems with the edges not being substantially defect free. The present invention addresses this problem . . . None of the references mention the production of bonded SOI wafers with defect free edges."[38] (JA-1210) A Notice of Allowability was issued on May 28, 1998 (JA-1214), and the '593 application issued as the '812 patent on November 10, 1998.

3. Claim construction

The pending motions concerning the '812 patent are Soitec's motions for: (1) summary judgment that its SOI wafers do not infringe claims 1, 2, 3 and 10 (the "asserted claims"; (2) partial summary judgment that the asserted claims of the '812 patent are invalid as anticipated or obvious; and (3) partial summary judgment that the asserted claims are invalid for lack of enablement. As the resolution of these Soitec's motions hinges primarily on the court's characterization of the invention, i.e., its construction of the claims, the court begins its discussion there.

This case presents a highly unusual fact pattern for purposes of claim construction. The specification of the '812 patent is essentially directed to one process

[38]Throughout the traversal, the applicants characterized their invention as being directed to a "SOI wafer" having the claimed properties.

– a process for the edge-stripping of BESOI wafers.[39] The ‘812 patent claims are directed to “SOI wafers” having certain edge-stripped characteristics (e.g., the device layer being radially contained within the periphery of the bonded surface). There is little disclosure in the specification describing the wafers that result from the application of the described edge-stripping process or, alternatively, of SOI wafers generally having the claimed characteristics. (*See id.*, col. 2:1-10; col. 5:1-10) The parties have not, on summary judgment, addressed whether (and how) the ‘812 patent claims meet the written description requirement in this regard.

“[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words or expressions of manifest exclusion or restriction.” *Martek*, 579 F.3d at 1381 (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1117 (Fed. Cir. 2004)); *see also Trading Technologies Intern., Inc. v. eSpeed, Inc*. 595 F.3d 1340, 1352 (Fed. Cir. 2010). Typically this principle is applied in the context of, e.g., broad product claims that are accompanied only by the disclosure of one exemplary product. This case involves broadly-drafted **product** claims which enjoy a presumption of validity vis a vis a specification describing one **process**.

The ‘812 patent claims, as product (and not product-by-process) claims, may not be limited by the process described in the specification. *See Abbott Labs. v. Sandoz, Inc.*, 566 F.3d 1282, 1291-92 (Fed. Cir. 2009) (citing *In re Hughes*, 496 F.2d 1216,

---

[39]The court views the processes disclosed in the ‘812 patent as two embodiments of one process. The court’s analysis would not differ if the specification were to be viewed as disclosing two related processes as compared to one process.

1219 (C.C.P.A. 1974)). There is no indication that this tenet should be ignored when that process constitutes the entirety of the disclosure.

While the court must not import limitations from the specification, this does not mean, however, that the court may not consult the specification to clarify the meaning of claim terms. *Trading Techs Intern.,* 595 F.3d at 1352. Rather, the claims "must be read in view of the specification, of which they are a part." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995), *aff'd*, 517 U.S. 370 (1996). In the case at bar, reading the claims "in view of" the specification, while not importing limitations therefrom, is a challenging exercise.

With reference to the prosecution history, described *supra,* there is no clear disclaimer which may justify a narrowing of the '812 patent claims.[40] In view of the foregoing, the court construes the limitations of the '812 patent consistently with their ordinary meanings as understood by a person of ordinary skill in the art, as illustrated by the intrinsic (the specification) and extrinsic (expert and documentary) evidence. *See Ultimax Cement Mfg. Corp. v. CTS Cement Mfg. Corp.*, 587 F.3d 1339, 1347-48 (Fed. Cir. 2009); *Maytag Corp. v. Electrolux Home Products, Inc.*, 411 F. Supp. 2d 1008, 1037-38 (N.D. Iowa 2006). The extent to which the claims (as so construed) are supported by the specification and/or disclosed by the prior art shall be discussed within the context of Soitec's nonenablement and invalidity motions.

---

[40]The court disagrees with Soitec's argument that the applicants' traversal of the § 103 rejection based on Iwamatsu constituted a clear disavowal of claim scope. At no point did the applicants characterize their invention narrowly such as to overcome an aspect of that reference.

4. Validity

a. Enablement

The court next evaluates Soitec's motion for partial summary judgment that the asserted claims of the '812 patent are not enabled. According to Soitec, the '812 patent fails the enablement requirement because it is "devoid of any description or teaching as to how to control thickness variance of the device layer of an SOI wafer" to meet the "thickness variance" and "mean thickness" limitations of the claims. (D.I. 211 at 2)

(1) Standard

The statutory basis for the enablement requirement is found in 35 U.S.C. § 112, paragraph 1, which provides in relevant part:

> The specification shall contain a written description of the invention and of the manner and process of making and using it, in such full, clear, concise and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same.

The Federal Circuit has explained that "patent protection is granted in return for an enabling disclosure of an invention, not for vague intimations of general ideas that may or may not be workable. . . . Tossing out the mere germ of an idea does not constitute enabling disclosure." *Genentech, Inc. v. Novo Nordisk A/S*, 108 F.3d 1361, 1366 (Fed. Cir. 1997).

To satisfy the enablement requirement, a specification must teach those skilled in the art how to make and to use the full scope of the claimed invention without undue experimentation. *Genentech*, 108 F.3d at 1365. "While every aspect of a generic claim certainly need not have been carried out by the inventor, or exemplified in the

specification, reasonable detail must be provided in order to enable members of the public to understand and carry out the invention." *Id.* at 1366. The specification need not teach what is well known in the art. *Hybritech v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384 (Fed. Cir. 1986).

Enablement is determined as of the filing date of the patent application. *In re Brana,* 51 F.3d, 1560, 1567 n.19 (Fed. Cir. 1995). The use of prophetic examples does not automatically make a patent non-enabling. The burden is on one challenging validity to show, by clear and convincing evidence, that the prophetic examples together with the other parts of the specification are not enabling. *Atlas Powder Co. v. E. I. Du Pont de Nemours & Co.*, 750 F.2d 1569, 1577 (Fed. Cir. 1984).

Some experimentation may be necessary in order to practice a claimed invention; the amount of experimentation, however, "must not be unduly extensive." *Id.* at 1576.

> The test for whether undue experimentation would have been required is not merely quantitative, since a considerable amount of experimentation is permissible, if it is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed to enable the determination of how to practice a desired embodiment of the invention claimed.

PPG Indus. Inc. v. Guardian Indus. Corp., 75 F.3d 1558, 1564 (Fed. Cir. 1996) (quoting Ex parte Jackson, 217 U.S.P.Q. 804, 807 (1982)).

A court may consider several factors in determining whether undue experimentation is required to practice a claimed invention, including: (1) the quantity of experimentation necessary; (2) the amount of direction or guidance disclosed in the patent; (3) the presence or absence of working examples in the patent; (4) the nature of

the invention; (5) the state of the prior art; (6) the relative skill of those in the art; (6) the predictability of the art; and (7) the breadth of the claims. *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988). These factors are sometimes referred to as the "Wands factors." A court need not consider every one of the Wands factors in its analysis. Rather, a court is only required to consider those factors relevant to the facts of the case. *See Amgen, Inc. v. Chugai Pharm. Co., Ltd.,* 927 F.2d 1200, 1213 (Fed. Cir. 1991).

The enablement requirement is a question of law based on underlying factual inquiries. *Wands*, 858 F.2d at 737. Enablement is a question of law, which the Federal Circuit reviews *de novo*, based on underlying facts, reviewed for clear error. *See Sitrick v. Dreamworks, LLC*, 516 F.3d 993, 999 (Fed. Cir. 2008). Summary judgment of nonenablement is appropriate when, construing all facts in the light most favorable to the non-moving party, the moving party has shown by "clear and convincing evidence that the specification of a challenged patent fails to teach one of ordinary skill in the art how to make the invention" without undue experimentation. *Ormco Corp. v. Align Tech., Inc.*, 498 F.3d 1307, 1318 (Fed. Cir. 2007); *see also Invitrogen Corp. v. Clontech Labs., Inc*, 429 F.3d 1052 (Fed. Cir. 2005). The burden of producing evidence contrary to nonenablement then falls on the nonmovant, who must assert a genuine issue of material fact. *See Crown Operations Int'l v. Solutia Inc.*, 289 F.3d 1367, 1375 (Fed. Cir. 2002). A genuine issue of material fact is presented if the evidence offered requires a finding of fact and a reasonable jury could find for the nonmoving party. *See id.*

(2) Discussion

As indicated previously, Soitec's motion concerns the following limitation of

independent claims 1 and 10 of the ‘812 patent: “a device layer having . . . a mean thickness of between 500 angstroms and approximately 50 microns with a thickness variance of less than approximately 10% of the mean thickness.” Soitec asserts that the specification is devoid of any discussion of how to control the thickness variance of the device layer in order to achieve a thickness variance of less than approximately 10%. (D.I. 211 at 4) More specifically, “MEMC provides no evidence that following the disclosed etch stop process as described in the patent, without reference to chemical etchant formulation or processing parameters, will inherently provide a device layer having a mean thickness variance of less than 10%.” (D.I. 275 at 3)

The court agrees with Soitec on the latter point. Because the ‘812 patent is presumed valid, however, it is presumed to be enabled. That is, it is presumed that the process disclosed in the specification results in the SOI wafers claimed. It is Soitec’s burden, as the movant, to produce evidence demonstrating that the examples of the ‘812 patent specification do not enable one skilled in the art to make and use the claimed SOI wafers without undue experimentation. As MEMC points out, Soitec offers no expert opinion in support of its theory in its opening papers, relying only on testimony by Dr. Robert Craven, a named inventor of the ‘812 patent, emphasizing that a process achieving the claimed thickness control had to be developed using, in part, processes that were “not all in the state of the art at that point in time.” (*Id.* at 8-9) This testimony supports MEMC’s position that the inventions were new and nonobvious; it is not persuasive evidence of nonenablement.

Indeed, Soitec offers no expert testimony on undue experimentation because its expert, Dr. Bravman, expressly contradicts Soitec’s nonenablement position. In

asserting that the ‘812 patent was obvious, Soitec stated that,

> as discussed by Dr. Bravman (Exhibit 31, App. 2, PA-455, 457, 458, 460, 461, 463-466, 468, 469, 472-475, 477, 478, 480-483, 485-488, 490, 491, 493), mean thicknesses within the claimed parameters were the commercial norm prior to the critical date, and achieving them was a matter of mere routine skill in the industry.

(D.I. 214 at 8) Further, Soitec stated that,

> as set forth by Dr. Bravman, one of ordinary skill would have known, based at least on the mentioned references show [sic], that the state of the art in November 1994 at least included knowledge of: . . .
>
> 2. Making bonded SOI wafers having a mean thickness of between approximately 500 angstroms and approximately 50 microns was the commercial norm and was well known and a matter of mere mechanical skill in the semiconductor art more than one year prior to [sic] November 30, 1994 filing date of the ‘812 patent.
>
> 3. Making bonded SOI wafers with a thickness variance of less than approximately 10% of the mean thickness was the commercial norm and was well known and a matter of mere mechanical skill in the semiconductor art more than one year prior to [sic] November 30, 1994 filing date of the ‘812 patent.

(*Id.* at 9) By Soitec’s expert’s own admission, the ‘812 patent is enabled, and its motion must be denied.

b. Obviousness

Soitec brings a motion for partial summary judgment that the asserted claims of the ‘812 patent are obvious in view of the combination of U.S. Patent No. 5,152,857 to Ito, et al. (“Ito”) with any one of: (1) U.S. Patent No. 4,601,779; (2) U.S. Patent No. 5,240,883; (3) U.S. Patent No. 5,310,451; or (4) an article by Mumula et al. entitled “Plasma Thinned SOI Bonded Wafers.”[41] (D.I. 214 at 14)

The court need not evaluate the majority of these references in order to rule on

---

[41](PA-964)

Soitec's motion. The '812 patent is, of course, presumed valid and it is Soitec's burden on summary judgment to demonstrate that MEMC cannot pair this presumption with other evidence to amount a validity defense at trial. Soitec has not met its high burden in this regard for several reasons. First, as acknowledged by Soitec, Ito was of record during the prosecution of the '812 patent. (D.I. 214 at 6; JA-1185) Soitec's "burden is especially difficult when the [asserted] prior art was before the PTO examiner during prosecution of the application." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1467 (Fed. Cir. 1990) (citation omitted). That is, "[t]he presumption of validity under 35 U.S.C. § 282 carries with it a presumption that the examiner did his duty and knew what claims he was allowing." *Intervet Am., Inc. v. Kee-Vet Labs., Inc.*, 887 F.2d 1050, 1054 (Fed. Cir. 1989) (citation omitted).

Secondly, Soitec cites no expert testimony in support of its broad assertions that the secondary references "clearly teach how to make wafers within the claimed thickness and thickness variance requirements and show that the skilled artisan could achieve such wafers," and that "[o]ne skilled in the art would have the common sense and ability to use the teachings of the secondary references to achieve the thickness and thickness variation requirements of the asserted claims for the wafers disclosed in Ito." (D.I. 214 at 15)

Soitec primarily relies on testimony from Dr. Robert Craven, a named inventor on the '812 patent, stating that the "less than approximately 10% of mean thickness" variance was "driven primarily by the customer specifications at that point in time" and that "[t]he yield [not thickness control ability] was the issue" in achieving that variance. (*Id.* at 16-17) Customer demands drive innovation in the majority of cases. Moreover,

yield, or put another way, the move from bench to plant, poses legitimate obstacles for many chemical processes. Absent more, Craven's testimony does not rise to the level of clear and convincing evidence.

Finally, Soitec admits that Ito teaches making the diameter of the bonding wafer smaller than the diameter of the base wafer – a non-industry standard. (*Id.* at 17) Ito also discloses the thinning of the smaller diameter wafer by an "excessive polishing step." (Ito, col. 4:7-16) As disclosed in (Soitec's) Bruel patent, "[t]hinning methods are not competitive from the uniformity and quality standpoints except when using the etch-stop principle." (Bruel patent, col. 1:66-col. 2:6) Accordingly, Moran opines that the polishing techniques of Ito did not result in device layer thickness uniformity and, because Ito began with a bonding wafer not having an industry standard diameter, a person of ordinary skill in the art would not be motivated to combine Ito with the other cited references. (MA-1876-80 at ¶¶ 41-52)

It was Soitec's burden to establish the absence of factual questions with respect to the motivation to combine (and reasonable expectation of success) components of the obviousness analysis; its cursory treatment of these issues fails to pass muster. Moreover, a reasonable jury could find Moran's testimony credible on the issue of nonobviousness. For all of these reasons, Soitec's motion (D.I. 212) is denied.

5. Infringement

a. The accused products

It appears that MEMC accuses at least three wafers of infringement in this case:

the 200mm, 300mm, and “BSOI” wafers.[42] (D.I. 249 at 6 & n.2) The parties primarily discuss infringement in terms of the product(s) resulting from particular steps in Soitec’s and the ‘812 patent’s respective processes. The court will briefly describe Soitec’s SMART-CUT™ process in order to frame the issues presented.

Soitec’s SMART-CUT™ process for producing SOI wafers begins with a layer transfer process, whereby the device wafer[43] that will be used to fabricate the finished SOI structure is oxidized. (D.I. 198 at 2)[44] In certain “limited” cases where a very thick dielectric layer is needed, Soitec will also oxidize the surface of the handle wafer. (*Id.*) After oxidation, “the [device] wafer is subjected to ion implantation in order to create a damage zone in the bulk of the donor wafer that will act as the cleave plane for layer transfer,” the damage zone being created by either hydrogen-only or “co-implantation” of helium and hydrogen ions. (*Id.*) The device wafer is flipped prior to bonding with a handle wafer, such that the substrate is the topmost layer, followed by the implanted bubbles, the thin silicon film, and finally the oxide layer as the bottommost surface. After ion implantation, the device and handle wafers are “plasma activated” to increase the strength of the bond that will result from pressing the oxide surface of the device

---

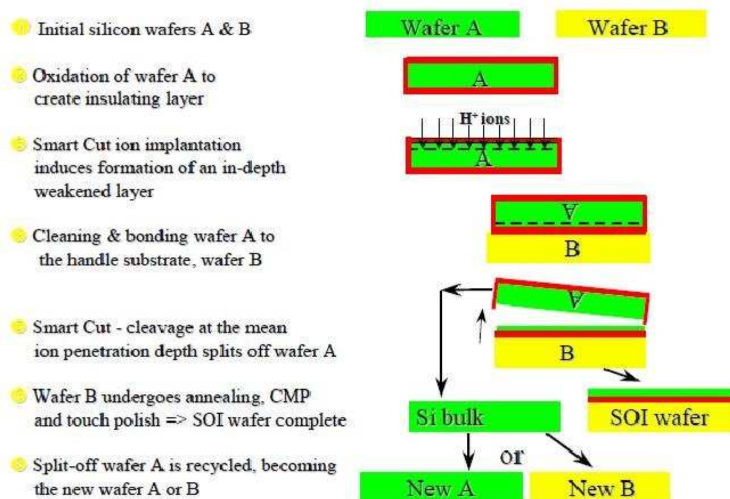
[42]Despite its theme that the court should not read process limitations into the product claims, MEMC does not clearly iterate the accused products in its opposition papers.

[43]Soitec refers to this as the “donor wafer;” the court refers to it as the “device wafer” for purposes of comparing the process to that described by the ‘812 patent.

[44]MEMC takes no issue with Soitec’s description of the SMART-CUT™ process in its answering papers and, as such, these facts are undisputed for purposes of the summary judgment record. The court need not recite the underlying documentary support cited by Soitec in this regard.

wafer to the upmost surface of the handle layer. (*Id.* at 3) This occurs at room temperature using a "hydrophilic bonding technique to create a bonded pair" of wafers. (*Id.*) The bonded wafer pair is then heated (in a furnace) to undergo a splitting anneal, which breaks off the top (majority) of the device wafer at the plane of the bubble formation. Following this anneal, the SOI structure is created: "the thin film of silicon that was beneath the oxide layer on the [device] wafer becomes the top layer of the handle wafer, and the oxide that was formerly on the surface of the [device] wafer is now beneath the top silicon layer and bonded to the handle wafer." (*Id.*) The SOI wafer then undergoes further processing such as high temperature annealing and surface polishing. (*Id.*)

The following schematic is an example of the foregoing, using hydrogen ion implantation and wafer-bonding to a silicon handle (Wafer "B").[45]



---

[45]Available at www.soitec.com/pdf/SmartCut_WP.pdf (last accessed August 16, 2010). This diagram is provided only to enhance the understanding of the description heretofore provided; it is not part of the summary judgment record and is not relied upon by the court in rendering its decision.

b. SOI/BESOI wafers

Soitec moves for summary judgment of noninfringement on several grounds. Soitec first argues that it cannot infringe the '812 patent because its claims (each drawn to a "SOI wafer") are limited to BESOI wafers. In support of this limiting construction, Soitec relies on the applicants' change of the '812 patent's title. (D.I. 278 at 3-4) Soitec also argues that the applicants made an "express limitation of claim scope to only BESOI" wafers because the abstract states that the patent discloses a "process for stripping the edge of a BESOI wafer," and because the problems sought to be addressed by the invention are unique to BESOI wafers. (D.I. 198 at 8-9) The Background of the Invention states that "[t]he invention generally relates to silicon-on-insulator ('SOI') bonded semiconductor wafers and, more particularly, to a process for stripping the outer edges of bond and etch back silicon-on-insulator ('BESOI') wafers." ('812 patent at col. 1:8-11) Finally, Soitec argues that the applicants limited their claim scope in distinguishing Iwamatsu. (D.I. 168 at 34-35)

The court disagrees that the foregoing is sufficient to constitute a disclaimer of claim scope. The claims are plainly drawn to "SOI wafers" and the applicants consistently referred to the claimed "SOI wafers" in their office action responses. Soitec does not point to any language distinguishing Iwamatsu on a SOI/BESOI wafer distinction. Soitec points to no specific disavowal of claim scope with respect to the BESOI "subclass" of SOI wafer. The court notes that Soitec's position is further undermined by the fact that it relies on SOI, and not BESOI, wafer references in its motion concerning the validity of the '812 patent. (D.I. 214) Soitec's motion is denied on this ground.

c. "Bonded"/"On"

Soitec next argues that its SOI wafers do not infringe the '812 patent because the oxide layer therein is not "bonded" to the device layer. The asserted claims require "an oxide layer **on** at least one surface of the handle wafer" and "a device layer having . . . a **bonded** surface . . . being **bonded** generally in its entirety to the oxide layer." In Soitec's products, the oxide layer is "almost always" thermally grown on the device wafer. (D.I. 198 at 11) Soitec argues, therefore, that in the **finished** Soitec wafers, the oxide layer is "on" but not "bonded" to the device layer as the claims require. Consequently, the parties disagree whether the device layer must be "directly adhered to the claimed oxide layer by wafer bonding," as Soitec argues, or whether generally all of one surface of the device layer may be "chemically bonded to the adjoining oxide layer" in any fashion, as proposed by MEMC.

In its opposition papers, MEMC points out that, "after the 1100° C thermal anneal step in Soitec's process, both surfaces are fully bonded to the oxide layer" – meeting even Soitec's narrowed construction of the claims. (D.I. 249 at 16) In its reply papers, Soitec does not dispute that the handle layer "may **eventually** be bonded to the oxide layer" in its process.[46] (D.I. 278 at 8) (emphasis added) According to Soitec, "the structure of the asserted patent suggests that the handle wafer and device layer as

[46]Soitec disputes whether MEMC can prove this point at trial. MEMC states that its expert, Dr. Moran, explained in his report (and may explain at trial) how Soitec's high temperature anneal causes the two adjacent oxide surfaces to react chemically with each other to form a continuous layer of oxide from the device layer to the handle wafer. (D.I. 278 at 8; D.I. 249 at 18) The cited discussion does not specifically address Soitec's process, but appears to support MEMC's proposition. (MA-1767-68) Regardless, for purposes of the summary judgment record, Soitec has stated that its process may meet the limitation.

described earlier in the claim must have the described characteristics prior to this 'bonding.' Thus, it is not enough that the oxide layer is eventually bonded to the handle layer; it must be 'on' the handle wafer prior to the 'bonding' of the device layer to the oxide layer, which could not happen without an oxide layer already present on the handle wafer." (D.I. 278 at 8)

As an initial matter, the court agrees with Soitec that the asserted claims require an oxide layer "on" the handle wafer and "bonded to" the device layer – the terms are not synonymous. The '812 patent specifies that oxide film may be "formed" or "grown on" a wafer layer. (e.g., '812 patent, col. 1:16; col. 4:42) In contrast, the applicants used the phrase "bonded to" when referring to the connection of two layers, generally in the company of heating. (e.g., '812 patent, col. 1:30; col. 1:41-42; col. 2:55-62; col. 4:39-49) For example,

> [a]n SOI bonded wafer has a handle wafer, a thin device layer, and an oxide film (layer), constituting an insulating film, between the handle and device layer. It is made from two semiconductor silicon wafers each having at least one face with specular gloss. An oxide layer is **formed on** the specular glossy face of one or both wafers, and the two wafers are **joined together** with the specular glossy faces facing each other and with the oxide layer being between the two wafers. The joined wafers are heated to an appropriate temperature to **increase the bonding strength**.

('812 patent, col. 1:11-20) (emphasis added) The court agrees with Soitec that the context of the applicants' separate usage of the "formed on" and "bonding" terms necessitates a construction of the "bonded" term that is narrower than, and exclusive of, the growth of a layer, or a layer "on" another.

The court disagrees with Soitec, however, that the structure of the asserted claims suggests that the handle wafer and device layer as described earlier in the claim

must have the described characteristics prior to “bonding.” Claim 1 of the ‘812 patent requires a device layer having a bonded surface that is “being bonded generally in its entirety to the oxide layer.” The claims use the present tense “being bonded,” not “having been bonded” or the like. The court declines to add a temporal limitation to the claims on this record. Put another way, the court does not limit the product claims by the disclosed process steps.

In view of the foregoing, Soitec’s SOI wafers may infringe at the annealing step if the wafers have an “an oxide layer on at least one surface of the handle wafer” and “a device layer . . . being bonded generally in its entirety to the oxide layer.” The bonds formed (or strengthened) at this high-temperature step would be accomplished by heat, not by the growth or formation of a layer. Soitec’s admission that the handle layer “may eventually be bonded to the oxide layer” in its process is sufficient to deny summary judgment insofar as it is plausable, therefore, that Soitec’s wafers comprise a handle wafer with an oxide layer “being bonded generally in its entirety” to a device layer.

The court notes in closing its discussion that there is no occasion to further limit the “bonded” term to require either “wafer” or “chemical” bonding, as posited by the parties, for several reasons. The specification does not use this lexicography. If these additions are not redundant to the plain meaning of “bonding,” as the term is used in the context of the specification and in the art, they are unnecessarily narrowing limitations that appear to have no support in the intrinsic record.

d. Generally annular recess

Soitec’s final noninfringement argument is that, under the parties’ agreed-upon claim construction, Soitec’s wafers do not have a generally annular recess adjacent to

the periphery (or “a ring-shaped region where material has been removed from the handle wafer”) and, therefore, it cannot infringe claim 10 of the ‘812 patent. (D.I. 198 at 13-14) In response to Soitec’s motion, MEMC asserts only that Moran has provided three photographs of the accused wafers indicating that the limitation at issue is met. (D.I. 249 at 20) Moran’s report is highly conclusory in this respect; he states only that “[t]he handle wafer and the generally annular recess in Soitec’s sample [200, 300]mm SOI wafer appears in the SEM image[s]” provided. (MA-1806 at ¶ 85; MA-1828 at ¶ 117) With respect to Soitec’s BSOI wafers, Moran simply references the labeled photograph provided. (MA-1846 at ¶ 148)

As Soitec points out, elsewhere in his report Moran states both that the “handle wafers of Soitec’s SOI products have a ring-shaped portion of removed material” and that Soitec requires its bulk silicon supplier to “remove material around the edge of the wafer to give the handle wafer a beveled shape that meets the SEMI M1 specification.” (MA-1791 at ¶ 69) MEMC argues that it is irrelevant at what point the material is removed. (D.I. 249 at 20) MEMC’s position appears to be that the handle wafers, as provided by the suppliers according to industry specifications, themselves contain a “generally annular recess” as required by claim 10. If, in fact, a standard manufacturing component for SOI wafers does meet the limitation of claim 10, then there would be no shortage of wafers comprising this patented “annular recess” feature in the prior art; that which infringes if later must anticipate if before. Notwithstanding, Moran’s conclusory opinion and MEMC’s cursory response on this issue[47] do not evidence a

[47]Comprising approximately one third of a page of MEMC’s responsive brief.

genuine issue of material fact on infringement. Soitec's motion is granted with respect to claim 10.[48] (D.I. 197)

6. Conclusion: the '812 patent

To summarize: (1) Soitec's motion for partial summary judgment of invalidity of the '812 patent for lack of enablement (D.I. 210) is denied; (2) Soitec's motion for partial summary judgment of invalidity of the '812 patent in view of prior art (D.I. 212) is denied; and (3) Soitec's motion for summary judgment of noninfringement of the '812 patent is granted with respect to claim 10 (D.I. 197).

V. CONCLUSION

The court has detailed its numerous holdings on the motions before it (*see* sections IV.A.5, IV.B.6 and IV.C.6, *supra*). An appropriate order shall issue.

---

[48]It is not clear from the parties' papers whether MEMC asserts infringement of additional claims of the '812 patent. The parties focus on claim 10 in their papers, and the court will grant Soitec's motion for summary judgment of noninfringement insofar as it appears to relate solely to this claim, with the understanding that MEMC will not be precluded from trying additional claims.